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[OFFICIAL NOTICE.]

Committee of Arrangements, Western Gas Association.

SECRETARY'S OFFICE, WESTERN GAS ASSOCIATION,
QUINCY, ILLS., Nov. 22nd, 1892.

To the Members of the Western Gas Association:

Gentlemen—I am requested by President Chollar to announce the following as the Local Committee of Arrangements for our Sixteenth Annual Meeting, which will be held in Chicago, in May, 1893:

Carl D. Bradley (Chairman), Geo. O. Knapp, Chas. D. Hauk, Fred. R. Persons, John Stout, C. H. Randle, S. S. Stratton, A. S. Miller, H. D. Harper, C. F. Bryant and P. S. Dickey.

Yours respectfully,
A. W. LITTLETON, Secretary.

BRIEFLY TOLD.

THE LOSS SUSTAINED BY THE MILWAUKEE COMPANY IN THE RECENT FIRE.—In our item columns for this issue (p. 771) will be found a very vivid account of the dangers that beset the Milwaukee Gas Light Company during the progress of the disastrous fire which prevailed in that city last month, and many of the points in Mr. Cowdery's picture—for the account we are indebted to that capable engineer and clever gentleman—are so much out of the common, even when compared with the records of other "big fires," of which we all have heard or know something about, that the Milwaukee recital takes on increased interest the oftener it is read. In the first place, Mr. Cowdery was away from home when the initial hint of the disaster reached him, whereupon the long-distance telephone was appealed to to apprise him swiftly and connectedly of the extent of the blow that had fallen, first, upon the city that is his home, and then upon the Company, no little part of the wonderful success gained by which is directly traceable to his guiding genius. Then follows the story of the troublous times, and, in all conscience, the recital is varied in scene and abounding in marvels. Take it all-in-all, the lesson of the happening and its results shows that the Milwaukee Company was exceptionally fortunate in its emergence from the fiery ordeal; but whether so or not, the outcome further shows that its proprietors were forearmed for the worst, because, as Mr. Cowdery succinctly puts it, "We carried insurance upon all portions of the works, so that the loss was fully covered." Perhaps this might suggest as the title for a paper at some future Association meeting: "Would not Insurance on Gas Works be Worth the Premium?" Still another striking thing in connection with the fire is brought out vividly in the heroism of the foreman, who stood by his post, neglecting home interests that he could not but have known were seriously threatened. The boy of old, as we are assured, stood on the burning deck, whence all, etc., but that boy's heroism is as nothing to the "humble foreman's" devotion at Milwaukee. The foreman could get away to the home that was in danger, whereas the "valiant boy," had he attempted flight, certainly at one stage of the proceedings, would have had to make the death choice between one of two shapes or forms. However, the Milwaukee foreman has made himself an odd place in the history of gas works employees.

FIELD'S ANALYSIS FOR 1891.—We confess it is rather late in the day to say a word respecting the 1891 edition of that sterling English work, known as "An Analysis of the Accounts of the Principal Gas Undertakings in England, Scotland and Ireland," which annual compilation is the result of the trained studies of Mr. John W. Field, Accountant to the Gas Light and Coke Company, of London. Nor can we place the backwardness or dilatoriness on anyone save ourselves, for a copy of the work, which was issued this year in May, has been on our desk since July last, owing to the courtesy of the publishers, Messrs. Eden Fisher & Co., of 50 Lombard street, London, E. C., by direction of the compiler, Mr. Field. However, the book is more valuable than ever, for Mr. Field, along with retaining the excellent general method followed in other years by him, has also paid much attention to the comparing of results obtained under some of the newer forms of enriching by oil as in vogue in England for the period under review. To use Mr. Field's

own explanation of this: "The compiler, in dealing with enriching materials other than cannel, has reduced them to their equivalents in tons of Lesmahahow, and has adopted, for this occasion, for petroleum oil, the basis of 75 gallons, and for petroleum spirit 50 gallons per ton, these being respectively the figures most generally accepted at this experimental stage of the new system of gas enrichment." Mr. Field's book is, as said before, more valuable than ever, and when that is said no higher praise can be given it. A copy of the compilation should be in the library of every American gas man, and those who desire to obtain it can secure the same by addressing the publishers of the JOURNAL.

THE SCIENCE AND PRACTICE OF LIGHTING.—Another valuable book for gas men, and laymen as well, recently received by us, through the kindness of Mr. Walter King, publisher of the London *Journal of Gas Lighting*, is entitled "The Science and Practice of Lighting, as Applied to Streets, Open Spaces and Interiors," and is by the well known English authority on these matters, Mr. W. H. Y. Webber. The volume is a reprint of a series of articles on the named subjects, originally contributed by the author to the London *Journal*, with the further understanding that the "original series" have been retouched and added to. Mr. Webber has put together five very interesting chapters, and his treatment of the subjects incident to the book is such that he who reads is not at a loss to comprehend Mr. Webber's meaning. The book has 95 pages of solid instruction between its covers, and it can be secured through us.

GAS FOR RAISING SUNKEN SHIPS.—A correspondent at Stockton, Cal., forwards the following: "The invention of the Grant Brothers, of Tacoma, Wash., by which sunken ships may be raised by means of canvas cylinders, inserted in the hold and inflated, has been shown to be practicable in one case. Early this month they took a contract to raise the ship "Premier," which was sunk 10 miles off Port Townsend, and executed it successfully. Thirty-five of the canvas cylinders were inserted in the vessel's hold and inflated, with very successful results. The cylinders were inserted at 8 o'clock A.M., and by 2 P.M., the vessel rose to the surface and was beached, the break in her side was repaired, and she was then towed to Victoria, B. C., everything having been accomplished in less than 24 hours. It is 10 years since the Grants began their experiments for the purpose of raising ships, and were led to make them by studying the bodies of drowned persons, and concluded that nature generated gas within the bodies, that caused them to rise. They labored and studied a long time, but finally hit upon a gas which, when driven into a balloon-like structure, made the body so light that it would lift a very heavy vessel from the bottom of a body of water. They then took out a patent and have been waiting about a year to make a practical demonstration of the efficacy of their invention. I will forward you something more about their system in a few days." We hope that our correspondent will keep his promise, for with all due deference to his explanation, we can only remark that it leaves us very much in the dark as to how the Grant Brothers secure such wonderful results. But our correspondent should not, because he is familiar with the details, presume that about every one of us is as clear on the subject as himself. Unfortunately, though, the average correspondent holds such belief, forgetting that what may appear trivial to one who is on the scene would be very imposing to the one far away—especially when the latter is attempting to solve the problem without other aid than the bare statement before him.

NOTES.—The Anglo-American Gas Control Company is engaged in bamboozling the gas consumers of San Francisco by selling to them a gas-saving governor.——During the recent drought, which was very severe in portions of Pennsylvania, the Girardville (Pa.) gas works was put to the necessity of filling its tanks with water carried a distance of 2½ miles, and not through water mains, either.

[A Paper read before the Society of Gas Lighting.]

Two Small Economies.

By MR. CHARLES H. NETTLETON.

I beg to apologize for again presenting a paper relating to residuals, and particularly as it is one more in the descriptive than in the experimental line; but pressure of work for several weeks has left me no choice, and, rather than let the year go by without contributing my mite, I have written out the following, which I trust may be of some interest.

First.—During the past summer a new steam boiler was erected at the works in my charge, and the saving in fuel is so large, comparatively, that I have been much pleased. Previous to this year there has been used an upright tubular boiler, of nominal 30-horse power capacity, and this supplied steam for the following purposes:

Two engines, running continuously, not using over 5-horse power each, a third for breaking coke occasionally, the ammonia concentrator for about 75 days in the year, and in the winter heating the various buildings.

As may be readily imagined the boiler was at times overloaded, and occasionally steam for some certain purpose was not to be had when wanted. The new boiler is of the horizontal, tubular type, 5 feet diameter, 16 feet 4 inches long, set in the usual way; has a 70 foot stack, 22 inches in diameter, and is nominally of 70 horse power. The cost of the whole, including a new boiler house, which is a brick "lean to" alongside the retort house, does not exceed $2,000.

For the year ending July 1st there was used in the old boiler 9,640 bushels of coke, besides all the screenings from the furnaces, and a considerable quantity of coke dust which was practically of no value. With the new boiler the consumption has not exceeded 10 bushels per day, or 3,650 bushels for the year, using all the screenings from the furnaces as before, and a very much larger quantity of coke dust. If the same working continues, and I know of no reason why it should not, the saving will be practically 6,000 bushels of coke, or $540 in each year; and in addition to this, the saving in time, in having steam when needed, will increase this saving to not less than $600. From this amount should be deducted:

Interest on investment, $2,000 at 6 per cent	$120 00
Wear and tear, 10 per cent	200 00
	$320 00

Leaving the net gain, $280. It can also be stated that the labor of caring for the boiler fire, which is done by the stokers, is lessened fully one-half, which to my mind is a very decided gain.

A friend, who has had a large experience with steam boilers, tells me that for economy in working he would always put in a boiler 50 per cent. larger than the requirements of the work; and while mine is a limited experience, so far as it goes, it bears out his statement.

Second.—Following the lead of others, I have put up a small coke elevator for broken coke, which is largely a copy of the one erected by our fellow member, Mr. Sherman, at New Haven.

As will be seen in the sketch on the wall, the whole apparatus consists of a steam engine, a coke breaker, sunk in the ground so that in operation it is only necessary to raise the coke about two feet, an endless belt, with buckets to raise the coke when broken, and an elevated bin for storage. From this bin the coke is drawn when wanted, and, by means of two screens, it is readily separated into "broken," "fine," and "dust."

As a part of the plan of operation, it might be stated that the broken coke falls from the screen into a wagon, which is divided into measuring compartments, and, from these last, in turn it is drawn, by means of valves at the bottom of each compartment, into bags in which it is delivered to the consumer. So that the whole operation involves, in the matter of labor, shoveling the coke into the breaker and raising the bags into the wagon when ready to be loaded.

A recent test gave the following results:

300 bushels were measured out; value, at 9 cents per bushel		$27 00
Produced when broken—		
251 bushels broken, value, at 11 cents	$27 61	
10 " fine, " 11 cents	1 10	
10 " dust, no value	—	
		$28 71
Difference		$1 71
Labor in breaking coke, less than	$00 30	
Interest 6 per cent. on cost, $800	$48 00	
Wear and tear, 10 per cent	80 00	
	$128 00	
Proportional part of $128 for 300 bushels on basis of breaking annually 60,000 bushels	$00 64	
		$00 94
Profit of breaking 300 bushels of coke		$00 77
Profit on amount broken yearly		154 00
To which can be added the labor saved compared with the previous method, not less than		240 00
The teams will and are earning more money by reason of not being compelled to wait so long to load up, saving not less than		100 00
Total saving not less than		$494 00

In the above no account is taken of the steam used, for the reason that the 10 bushels of coke dust produced will make much more steam than is needed for breaking the 300 bushels of coke.

The cost of the apparatus without engine was less than $500, and for the latter I have allowed $300, making the total investment $800, on which interest and depreciation have been figured.

As a matter of fact, the engine was used for this same purpose before, and consequently the actual cash outlay was $500, which amount I hope and believe will be saved in the first year.

I think you all know I am very much interested in the amount that can be derived from residuals, and it is possible that I devote more time and thought to the possible saving from their sale than is warranted; but in the two cases above cited, by a not large investment of either time or money, an annual saving has been effected of not less than $780, and, in addition, the changes have been in the direction of operating the works with less friction and annoyance and at the same time with greater safety.

[Reprinted from the *Engineering Magazine.*]

Relative Cost of Gas and Electricity.

By Mr. C. J. Russell Humphreys.

The industry of electric lighting has reached an age at which it would not be amiss to glance at the question of cost as compared with that of the older illuminant, gas, which we were once told was to be consigned so speedily to the background. At the very threshold of the subject one is struck with what may be called the receptive capacity of the world for new industries. We are told that one gas acts as a vacuum to another, and so it has seemed in the lighting business; though the world has absorbed in a vast amount the newer illuminant known as electricity, it does not follow that the use of gas has decreased to a corresponding degree. On the contrary, more gas has been used, year after year, showing that the world is finding use for a larger amount of artificial light.

A glance at night along the main thoroughfares of any large city will show a vast increase in the amount of light used, as compared with a period twenty years back. Much lighting is done now purely for advertising purposes. It no longer suffices to have a store lighted so that salesmen and customers can find their way around, before and behind the counters, and stop at that; the whole interior of the shop, and the exterior as well, must be flooded with light, and whether the lighting agent be gas or electricity, it must be of high intensity and in large volume. The effect of this is far-reaching, for the merchant who grows used to bright lights in his store or counting room insists on having a great deal of light at his home. Nor is this all. In days gone by it would suffice if the streets were lighted with lamps few and far between, but now they must be lighted in the fullest meaning of the term. Again, the tendency in recent years to erect sky-scraping buildings, which shut off the natural light from the smaller edifices and the lower stories of the larger ones, entails the use of vastly increased amounts of artificial light during that portion of the 24 hours when Old Sol was once supposed to do all the lighting business. Thus it happens that this large receptive capacity of the world for artificial light has led to the building up of a large business for the electric light corporations, without by any means snuffing out the older illuminant. In support of this assertion it can be shown that in 1891 the gas companies of Massachusetts made 20 per cent. more gas than in 1889.

This showing is the more remarkable when we consider the business done by the electric lighting companies of the same State. The figures for 1891 show that the gross receipts of these companies was equal to 45 per cent. of the gross receipts of the gas companies, a statement which is at once a testimonial to the energetic manner in which the electric lighting business has been pressed, and evidence of the increasing demand for artificial light. To illustrate the latter tendency in another way, it may be shown that in the same State, during 1889, the capacity of the incandescent electric light companies aggregated 84,400 lights, reduced to the standard 16-candle lamps, whereas in 1891 the figures had grown to 183,120 lamps. During the same years the capacity of the arc light stations increased from 11,529 to 15,338 lamps.

The questions now thrust themselves upon our attention: Is this rapid growth to hold for the future, and how will it affect the sale of gas for lighting purposes? Brushing aside vague generalities, we must admit that the answer depends very largely upon the relative cost of gas and electricity. An element to be considered, perhaps, is whether the electric light companies have been doing business at unremunerative rates, thus achieving a doubtful prosperity. If we refer to the Report of the Gas Commissioners of Massachusets for the year 1891, we will see that the interest earned on the capital invested in 61 electric light companies doing business in that State was about 5½ per cent., and at the same time there was charged off for depreciation only about two-thirds of one per cent. on the capital stock. It would seem, therefore, that many electric light companies are doing business for the benefit more of the public than of the stockholders; doubtless many of these companies are in their present uncomfortable position by reason of mistakes in early construction, or the selection of unfortunate sites for their works, and will in time work out of their difficulties. Such mistakes are inseparable from the starting of any industry. Still it is well, if any one is inclined to undue elation at the progress made by the electric light companies in gross earnings and increase in plant, to temper his joy by a calm perusal of the net result, in order that he may not deceive himself.

The question now arises: How can we compare the relative cost of gas and electric light? We must reduce our figures to a common standard, which will be 16-candle light, and then consider the relative amount of capital required in each business per unit of light, and the percentage of gross receipts in each case required to pay the expenses of manufacture and distribution. We may then inquire which light will produce to the company the larger gross revenue per standard of light, which is merely another way of saying whether the public are willing to pay more for one light than the other.

It is safe to say, we think, that the capital required by an electric light company engaged in central station lighting—that is, supplying light to a large number of customers from a central station—will approximate $30 per unit of light capacity of the station, or $30 per dynamo capacity of the station reckoned on a basis of a 16-candle light.

This, however, does not afford at once an opportunity to compare the relative capital required by the two industries. It is customary to figure the capital in the gas business at so much per thousand feet of gas annually sent out, and when we assume this figure to be $6, we are not yet in a position to make any comparisons, as in one case we have merely the dynamo capacity of the station, and in the other the total output from the gas works. We must, therefore, reduce our figures to the basis of a lamp hour—that is, the light of 16 candles for 1 hour—which means, in the case of electricity, that we must determine about how many lamp hours, on the average, will be sent out by an electric light station for each 16-candle light capacity thereof. And in constructing an average daily load card, we must remember that up to date it does not seem feasible to store electricity, and that therefore the capacity of the station must be equal (and still have a proper margin for reserve) to the maximum demand for light in any hour—as for instance during the busy hours of a Saturday evening in winter. A gas works, with proper storage capacity, can lay up during the week enough gas to meet the heavy requirements of Saturday evening, but not so in the electric station; here the plant must be equal to the maximum call, and further, there must be a fair reserve then, for that is just the time that an accident resulting in the shutting off of a portion of the lights of a city would be borne with the poorest grace. So we will assume a reserve of never less than 25 per cent., and on that basis construct a load card for the average day of the year, thus arriving at the average lamp hour output per 16-candle lamp capacity of the station.

Number of Hours.	Output in Per Cent. of Dynamo Capacity.	Output per 16 c. p. lamp Capacity of Station.
One	.45	.45
Three	.25	.75
Two	.10	.20
Eighteen	.05	.90
Total output		2.30

This is an average output per hour, per 16-candle power lamp capacity of station, of $\frac{2.30}{24} = .090$ lamp hour, which would give us 839.5—or say 840—lamp hours, per year for each 16-candle power lamp capacity. From this we find the capital required per unit adopted for comparison—3.6 cents. In the case of gas we will assume that $6 is the capital per 1,000 feet of yearly output, and that the gas is 18-candle power, which would of course be low for New York city, but would hold as a good average, and we find in this case the capital required is 2.6 cents per standard of comparison. In different language, the capital required per 16 candle lamp hour output is as follows:

For electric light.....3.6 cents.
For gas, on the same basis.....2.6 cents.

according to which the electric lighting plant requires 40 per cent. more capital for doing a given amount of business.

When we come to compare the relative cost of manufacture of gas and electricity, and express the same in percentage of gross receipts, we find a further difficulty of comparison from the fact that the gross receipts from electric light per unit lamp hour are greater than in the case of gas by about 28 per cent.; therefore to compare the cost of the two lights we must make the comparison in percentage of the gross receipts of gas. When we reduce the receipts and expenditures to our common

standard—a 16-candle lamp hour—and express the relative cost of the two systems in percentage of gas gross earnings, we find the following result:

Cost of gas in percentage of gross earnings.....71 per cent.
Cost of electric light in percentage of gross earnings of gas from equal unit of light..... ..91 per cent.

or, otherwise expressed, the unit of light costs by electricity 20 per cent. more than by gas.

We thus find that in order to obtain the unit of light from gas or electricity we must invest 40 per cent. more capital in the electric business than in gas, and the cost of making the unit of light will cost by electricity 20 per cent. more than by gas, as expressed in percentage of gross receipts of the latter. And as the earning of a 6 per cent. dividend on the capital invested requires in the case of gas an amount equal to 26 per cent. of the gross earnings, and as the capital required in the electric business per unit of light is 40 per cent. greater than in the gas industry, it follows that in order to obtain a profitable investment from the electric business we must obtain for a dividend an amount equal to 36 per cent. of the gross earnings from gas. That is if A = gross receipts from gas per unit of light, then we must obtain for electric light: (A + 91 per cent.) + (A + 36 per cent.) or 127 per cent. of the price of gas, which simply means that, if gas sells for $1 per 1,000 feet, the selling price of electricity for an equivalent light must be $1.25.

That this is the practical result so far is evident from the fact that, as before noted, the receipts from electricity per unit of light are about 28 per cent. greater than from gas.

It avails nothing to say that this statement is disproved by the operation of electric companies in certain cities, where they are selling electricity at the same price as gas and paying dividends, for we are not concerned with individual cases, but dealing with average results. Such exceptions to the rule might be explained by an abnormally high price for gas in those cities, or by the fact that the electric companies have confined their operations to the thickly settled portions of the cities and have taken only the best paying customers—those of long burning hours. But these cases offer no suitable basis for comparisons.

We have based our figures on a 16 candle power unit, not forgetting the claim of the advocates of gas lighting that what purports to be a 16-candle electric light fails to net the consumer any such amount of illumination, because the incandescent lamp falls off in efficiency so soon. While conscious of this fact, we have disregarded it in our calculations because we are dealing with comparative results. Besides, this loss is pretty well balanced by that which the gas consumer suffers from poor burners; the loss in efficiency in the former case may be more rapid than in the latter, but as it is darkest before dawn, so the incandescent, as it approaches its period of lowest results, nears the time when it will be replaced by a new lamp, thus giving the customer the dawn of better things in the shape of the original strength of the incandescent. But the gas customer, while perhaps suffering a lesser proportional loss through a defective gas burner, is apt, through ignorance of his loss, to bear it for a longer period of time; hence these losses may be held to balance each other.

The electrician may say that the results here noted have been reached with small dynamos and single cylinder engines, entailing a large expenditure of capital per unit of light and a high running cost, and that in future we will have machines of greater economy. True, we have based our figures on results obtained, and not on the hopes of the future; but this must perforce be the case, for were we to temper our figures by the possibilities of the future in the case of electricity, it would be necessary to do the same with gas lighting. We are trying to deal with facts, not prophecies. We are not unmindful of the economies offered by the new and large dynamos, wherein two dynamos are connected directly on one foundation with a triple expansion engine; we realize the economy that may result in capital account and in daily running expenses; but we also have before us the improved results which are flowing from the combination of coal and water gas, wherein the residuals of the one system are converted into gas by the other. Nor is our vision stopped by the view of the inclined gas retort, allowing the coke from the coal gas system to fall by gravity into the water gas generator, thus reducing labor account to the minimum, but we see the coal dumped by mechanical means into huge retorts in which first the coal is deprived of its volatile constituents by carbonization, and then by the changing of a few valves the retort becomes a generator and the residual coke is converted into carbonic oxide and hydrogen gas with practically no labor.

If we are to discount the future and figure on the possibilities of reducing the cost of electricity by improvements in the steam engine, then we must consider also the possibilities before the gas engineer in converting the energy of the gas into light, remembering that by our present wasteful method of burning gas we actually utilize a scant 8 per cent. of the energy of the gas, the balance passing off as low heat rays. For these reasons we confine our observations to the present and leave the future to care for itself, remembering that both gas and electricity have their inception in the coal pile, that both systems waste a large amount of that precious energy, that both schemes of lighting offer great rewards to those who will reduce this waste, and that in the long run that system will predominate which gives out in the form of light the greatest percentage of the energy of that substance we all regard with such indifference, but which future generations will husband, guard and protect with such jealous care—coal.

The Isbell Apparatus for Generating Gas.

On October 25th U. S. Letters Patent were granted to Charles W. Isbell for an improvement in gas making apparatus. Using the words of the specification:

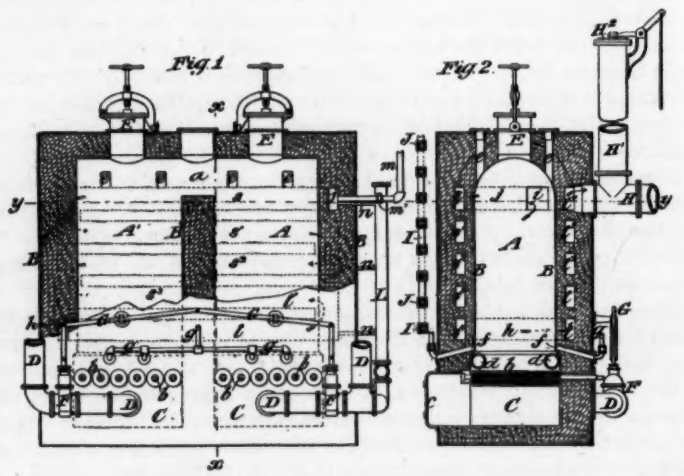
This improvement relates, generally speaking, to apparatus for the production of what is commonly known as "water gas" for illuminating purposes by first passing steam through incandescent coal to obtain a gas or gases, consisting of carbonic oxide and hydrogen, then adding to such gas or gases a proper quantity of the vapor of a hydrocarbon oil or liquid, and finally subjecting the said gas or gases and vapor together to a heat sufficient to convert the mixture into a permanent gas.

The invention relates particularly to the provisions hereinafter described and claimed for the heating and thereby converting or, as it is commonly termed, "fixing" the said mixture, such provision consisting principally in passages formed within the outer walls of the chambers or furnaces in which the carbonic oxide and hydrogen gases are generated, such passages constituting fixing retorts heated by the gases and gaseous products of combustion from the said generating chambers or retorts.

Figure 1 represents an elevation, partly in section, of an apparatus for generating gas embodying my invention. Fig. 2 represents a transverse section taken in the line $x\ x$ of Fig. 1 and viewed from the left. Fig. 3 represents an elevation of the side opposite to that shown in Fig. 1. Fig. 4 represents a horizontal section in the line $y\ y$ of Figs. 1 and 2.

Similar letters and numerals of reference designate corresponding parts in all the figures.

A A' are chambers for the generation of the carbonic oxide and hydrogen represented as formed in a furnace like structure *B* and separated by a partition wall *B**, which, not extending to the top, leaves a communication between them, as shown at *a* in Fig. 1. Two such chambers are represented; but the number is immaterial. There might be only one. At the bottom of each chamber is a grate composed of bars



b, below which is an ashpit *C*, provided on one side with an air tight door *c*, and having connected at its opposite side a pipe *D* for the introduction of air under pressure from any suitable blowing apparatus. Above the grate there are clearing holes *d*, Fig. 2, for cleaning out the bottom of the furnace. There are also clearing holes *e*, Figs. 1 and 2, at the top for the introduction of irons for cleaning the side walls. At the top there is also a hopper *E* for the introduction of coal, and near the bottom there are on opposite sides openings *f* for the introduction of steam supplied by a pipe *g* from any suitably located boiler.

The pipes *D* are furnished with valves *F*, controlled by levers *G*, for

the purpose of admitting and shutting off the supply of air through the pipes *D* to the ashpits *C*.

So far as I have at present described the apparatus it does not differ materially from other apparatus employed for the generation of carbonic oxide and hydrogen by causing steam to pass through incandescent coal.

I will now proceed to describe the features which constitute my invention.

In the front and rear walls of the furnace *B*—that is to say, in the front and rear walls of the generating chambers—are built a series of

Fig. 3.

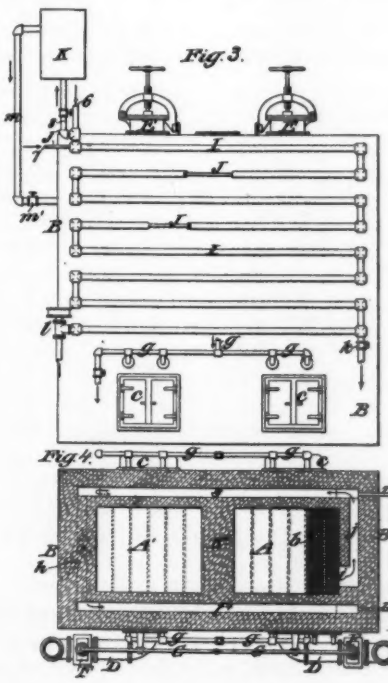
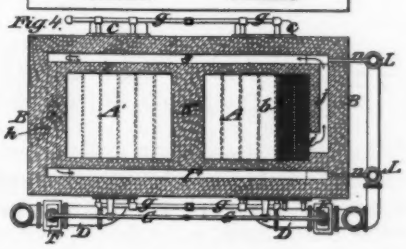


Fig. 4.



flue-like passages, arranged one above another, and extending nearly the whole length of the structure and constituting fixing retorts, those on the front wall being designated by $s\ s'\ s^2\ s^3\ s^4$ and those on the rear wall being designated by $t\ t'\ t^2\ t^3\ t^4$. The several passages of the series in either wall have such communication each with the one above or below it at opposite ends alternately that a circulation is provided for from one to the other throughout the series. This may be understood by reference to Fig. 1, where parts of both series are shown in dotted outline. The circulation through the series $s\ s'\ s^2\ s^3\ s^4$ in this example is downward and that through the series $t\ t'\ t^2\ t^3\ t^4$ is upward. The lower passages of the two series are in communication through a cross passage *h*. (Shown in section in Fig. 1 and in dotted outline in Figs. 2 and 4 in one of the end walls.) In the upper part of the chamber *A* (see Fig. 2) is a gas outlet *i*, which is common to both chambers, as they are always in communication over their partition wall *B**, and from this outlet a cross passage *j* runs to the upper passage *s*. The final outlet for gas after passing through the several passages in the walls is from the upper passage t^4 by a pipe *H*. On this pipe is an upright pipe *H'*, which serves as the chimney in blowing up the fires in the furnace, but at other times is closed by a damper H^2.

The vaporizing apparatus for vaporizing the hydrocarbon oil or liquid to be added to the carbonic oxide and hydrogen gases generated in the chambers *A A'* is represented as consisting of an upright gridiron coil or pipe *I*, through which passes a similar coil of smaller pipe *J*. The oil or liquid to be vaporized is introduced at 6 by a pump or otherwise into the upper part of the coil *I*, and steam, preferably superheated, is introduced at 7 to the upper part of the coil *J*. At the bottom of the coil *I* is provided a cock *k* for drawing off the heavy waste of the oil or liquid, and at the bottom of the coil *J* is provided a steam trap *l*, which provides for the escape of water of condensation from the said coil.

At the upper end of the coil *J*, besides the inlet 6, there is provided an outlet pipe 8 for the hydrocarbon vapors generated in the coil *I* by the heat of the coil *J*, the said pipe 8 leading to a reservoir *K*, whence the said vapor passes out by a pipe *m*, which enters the passage *j* near the outlet *i* of the generating chambers, and so delivers the vapor into the gases escaping from the generating chambers. This pipe is represented as furnished with a cock at *m'*.

For the purpose of introducing air into the series of passages $s\ s'\ s^2\ s^3\ s^4$ in the walls of the structure *B*, containing the chambers *A A'*, I have shown a branch pipe *L* from one of the air pipes *D*, and several smaller branch pipes *n*, leading from the said branch pipe *L* into the said series of passages, the object of thus admitting the air being to complete the combustion in the said passages of gases which are generated in the chambers *A A'* and which escape from the said chambers through the said passages during the blowing up of the fires, such combustion serving to increase the heat of said passages for the subsequent operation of converting or fixing the mixture of carbonic oxide and hydrogen and carbonic vapor passing therethrough.

To start the operation of the apparatus, the chambers *A A'* are charged with coal, the fires are lighted, the outlet of the pipe *H* is closed and that of the air pipe *H'* or chimney is opened, the hydrocarbon vapor pipe *m* being shut off, the air being admitted through the pipes *D* under and through the grates and also through the pipe *L* and its branches *n* into the passages in the side walls of the generating chambers. The coal in the chambers *A A'* being brought to a sufficient heat, the air is all shut off, the pipe *H'* is closed and the pipe *H* opened, and steam is admitted to the chambers through the pipes *g* and openings *f*. The generation of gas then commences in the said chambers, and as fast as the gas is generated it passes out through the outlet *i* into the cross passage *j*, where it is met by the hydrocarbon vapor introduced by the pipe *m*. The gas and vapors then passing through the flue *j* into the passage *s*, thence successively through the other passages $s'\ s^2\ s^3\ s^4$ in the same wall and afterward through the cross passage *h* into the retort *t* in the other wall, and thence through the other passages $t'\ t^2\ t^3\ t^4$ in the last mentioned wall are kept for a long time subject to intense heat and are first thoroughly mixed and afterward converted into a fixed or permanent illuminating gas, in which condition it passes off from the upper passage t^4 by the pipe *H*.

It will be observed that the series of passages constituting retorts in the front and rear walls of the furnace and the cross passages in the end walls also constitute a descending flue on one side and an ascending flue on the opposite side of the furnace, the said flues communicating with each other, and so constituting a continuous system of flues between the combustion chamber of the furnace and the final outlet for the gas through the pipe *H*.

Calculation of the Heat of Combustion of an Illuminating Oil Gas and Comparison with the Heat Determined by Experiment.

By Prof. D. S. JACOBUS, in *The Stevens Indicator*.

The composition of the gas considered, as determined by a number of analyses,* gave the following per cents. by volume:

Carbonic acid	.5
Marsh gas	57.7
Hydrogen	3.4
Illuminants	38.1
Nitrogen	.3

The illuminants, or the hydrocarbon gases, with the exception of marsh gas, cannot be separated from each other without a very elaborate analysis, so that for the present purpose the subdivision of the 38.1 per cent. given above is assumed at two probable figures, one of which will tend to give a high heat of combustion per cubic foot of gas, and the other a low heat of combustion. The difference in the heat of combustion under the two assumptions amounts to 8 per cent. The experimental value for the gas in question falls between the two theoretical values. The two assumed divisions of the 38.1 per cent. by volume of the illuminants are as follows:

	1st Division.	2d Division.
Benzole vapor C_6H_6	5.0	10.0
Propylene, C_3H_6	10.0	10.0
Olefiant gas, C_2H_4	23.1	18.1

The theoretical heat of combustion for the first division is 1,231 B.T.U. per cubic foot of gas at 85° F., which was the temperature of the gas in making the experimental determination of the heat of combustion. For the second division the theoretical heat of combustion is 1,337 B.T.U. The heat of combustion by direct experiment is 1,247 B.T.U. per cubic foot.

The method of making the heat measurements and a description, in detail, of the apparatus used will be presented at the New York meeting of the American Society of Mechanical Engineers next November in connection with a paper on the "Heat Generated per Candle Power by Oil and Gas Lamps."

A general description of the apparatus was presented at the Rochester meeting of the American Association for the Advancement of Science, which is as follows:

* Analyses made by Dr. William E. Geyer.

"The lamps are placed in an air-tight box, leading to the bottom, and from the top of which are galvanized iron pipes. The top exit pipe is furnished with a damper and a special deflector device to thoroughly mix the air before its temperature is measured. For still further accuracy in measuring the exit temperatures five thermometers are used at the same cross section of the pipe with their bulbs located at the center, edges, and at intermediate positions. Arrangements are made so that radiant heat, either direct or reflected, cannot affect the readings of the thermometers. The lamps are run at the required candle power, and the readings of the temperatures and of an anemometer placed in the inlet pipe carefully noted. After running steadily for about three hours the lamp is taken out and a steam radiator coil put in its place. By regulating the amount of steam that flows into the radiator the temperatures and reading of the anemometer are made the same as for the lamp. The amount of heat given up by the radiator coil is then the same as that given up by the lamp, and may be determined from the weight of steam condensed. To make certain of the quality of the steam entering the radiator, it is slightly superheated and its pressure accurately measured. The temperature of the entering steam and of the condensed water leaving the coil is measured by means of thermometers placed in mercury wells. The coil is arranged so that the condensed steam drains readily from it. If any portion of the coil or pipes leading to and from it tends to hold back the condensed steam, it will flow from the coil in an irregular way, and exact readings cannot be obtained, The condensed steam flows downward to a small stand pipe containing a gauge glass, in which it is held at a certain height by throttling a discharge valve. It is finally discharged under the surface of cold water, so that there is no loss from evaporation. The advantage of this method is that the effect of radiation from the box may be eliminated, so that an accurate standardization of the anemometer is unnecessary."

As a general check on the accuracy of the measurements, the heat of combustion of petroleum illuminating oil as deduced theoretically was compared with that determined by experiment; this showed that the heat by experiment was about 1.1 per cent. lower than that deduced from the analysis. In similar comparisons, made by H. St. Claire de Ville on Russian petroleums, the difference was found to range from 1.7 per cent. to 3.5 per cent.*

The detailed calculations of the heat of combustion of the gas are given in Tables I. and II.

TABLE I.—*Calculation of the Total Heat per Pound of Gas. First Division of Illuminants.*

Gas.	Per Cent. by Volume.	Density.	Weight in Terms of an Equal Volume of Air.	Per Cent. by Weight	Heat Units per Pound.	Heat Units in Portions Contained in 1 Pound of Mixture.
Benzole vapor, C_6H_6..	5.0	2.770	.1385	16.4	17,702	2,903
Propylene, C_3H_6.....	10.0	1.451	.1451	17.2	19,737	3,395
Olefiant Gas, C_2H_4...	23.1	.978	.2259	26.8	20,050	5,373
Carbon monoxide, CO	.5	.973	.0049	.6	4,369	26
Marsh gas, CH_4.....	57.7	.559	.3225	38.3	21,425	8,206
Hydrogen, H.....	3.4	.069	.0023	.3	52,368	157
Nitrogen, N.....	.3	.972	.0029	.3	0	0
		Density	=.8421	B.T.U.	per lb. =	20,060

$$\text{B.T.U. per cubic foot at } 85^\circ \text{ F.} = \frac{20{,}060 \times .8421}{13.72} = 1{,}231.$$

In the calculations given in Tables I. and II. the heats of combustion, with the exception of that of hydrogen, have been reduced from the experimental values of Julius Thomsen,† in the translation of which I have been kindly assisted by Professor Riesenberger. The latent heat of the water vapor in the products of combustion has been deducted from the total amount in obtaining the figures employed in the tables. The method of making the deduction and of reducing to British units is given in Table III.

In allowing for the water vapor the latent heat is taken at that corresponding to the temperature at which the vapor was condensed in Thomsen's experiments. This is 64.4° F., at which temperature the latent heat is 1,068 B.T.U per pound. Column 6 in Table III. is therefore obtained by multiplying the quantities given in column 5 by 1,068.

TABLE II.—*Calculation of Total Heat per Pound of Gas. Second Division of Illuminants.*

Gas.	Per Cent. by Volume.	Density.	Weight in Terms of an Equal Volume of Air.	Per Cent. by Weight	Heat Units per Pound.	Heat Units in Portions Contained in 1 Pound of Mixture.
Benzole vapor, C_6H_6..	10.0	2.770	.2770	29.7	17,702	5,257
Propylene, C_3H_6.....	10.0	1.451	.1451	15.6	19,737	3,079
Olefiant gas, C_2H_4....	18.1	.978	.1770	19.0	20,050	3,809
Carbon monoxide, CO	.5	.973	.0049	.5	4,369	22
Marsh gas, CH_4.....	57.7	.559	.3225	34.6	21,425	7,413
Hydrogen, H.....	3.4	.069	.0023	.2	52,368	105
Nitrogen, N.....	.3	.972	.0029	.3	0	0
		Density	=.9317			19,685

$$\text{B.T.U. per cubic foot at } 85^\circ \text{ F.} = \frac{19.685 \times .9317}{13.72} = 1{,}337.$$

The heat of combustion of hydrogen is that deduced from the experiments of Favre and Silberman, as published by them in 1852.* This was some time after their determination on the heat of combustion of hydrogen was first published, at which time they reported that the heat in calories per kilogram was 34,188 † The value reported in 1852 was 34,462 calories per kilogram, or 62,032 B.T.U. per pound. The experiments were made at 54° F., so that the heat contained in 1 pound of the steam in the products of combustion is 1,076 B.T.U., and in the 8.981 pounds of steam formed by burning 1 pound of hydrogen 9,664 B.T.U. The heat per pound of hydrogen, assuming that the water vapor in the products of combustion is not condensed, is, therefore, 62,032 — 9,664 = 52,368 B.T.U.

Favre and Silbermann's determination of the heat of combustion of hydrogen has been used in preference to that determined by Thomsen, as it is more nearly an average of the values determined by other experimenters than is the one given by Thomsen. The value given by Thomsen practically agrees with that of Andrews. Both these experimenters burned the oxygen gas in an atmosphere of hydrogen, whereas all other determinations, including those of Favre and Silbermann, were made by burning the hydrogen in an atmosphere of oxygen. Favre and Silberman's value is only 0.8 per cent. greater than that given by Thomsen. In the deduction from the experimental data given by Thomsen he disregards the latent heat of that portion of the water vapor that remains, together with the excess of hydrogen in the combustion chamber at the end of the experiment. The effect of the heat in this small amount

TABLE III.—*Heat of Combustion Reduced from Values Given by Julius Thomsen, and Diminished by the Amount of Heat Carried off by the Water in the Products of Combustion.*

Gas.	Heat per Molecule, by Thomsen.*	Molecular Weight.	Calories per Kilogram.	British Thermal Units per Pound.	Water per Pound of Gas, in Pounds.	Heat in Vapor, in B.T.U.	Net Heat per Pound, in B.T.U.
Benzole vapor, C_6H_6.....	797,530	77.844	10,245	18,441	.692	739	17,702
Propylene, C_3H_6	491,620	41.921	11,727	21,109	1.285	1,372	19,737
Olefiant gas, C_2H_4.....	332,590	27.947	11,901	21,422	1.285	1,372	20,050
Carbon monoxide, CO.....	67,810	27.937	2,427	4,369	0	0	4,369
Marsh gas, CH_4.....	211,450	15.974	13,237	23,827	2.249	2,402	21,425

* These are obtained by multiplying the heat per molecule, as given by Thomsen, by $\frac{43.9}{44}$ in order to reduce them to the exact atomic weight. In his determinations the amount of gas burned was estimated by weighing the carbonic acid formed and the molecular weight of the latter considered to be 44, so that to reduce to exact molecular weights we have applied the above correction.

* *Comptes Redus*, page 192, 1871.
† *Thermochemische Untersuchungen von Julius Thomsen.*

* *Annales de Chimie et de Physique*, 1852.
† *Comptes Rendus*, Vol. XVIII., 1844, p. 695.

of vapor influences the average figure he gives less than 0.2 per cent., but on applying it to the individual tests it makes the first one give nearly the same value as that determined by Favre and Silbermann. The total difference between the values given by Favre and Silbermann and Thomsen will not, however, affect the accuracy of any practical problem. The value given by Favre and Silbermann is a mean of six determinations, the highest and lowest of which differ from each other by 0.7 per cent.

Stopped Ascension Pipes: Their Cause and Cure.

[Contributed by Mr. T. B. Jones to the Proceedings of the October Meeting of the Midland Association of Gas Managers.]

I felt I could not refuse the kind invitation of our Honorary Secretary to do something for our Association—something to make our meetings useful as well as attractive. The question, however, that presented itself to my mind was, what subject shall I take up, as the whole ground has been traversed so many times before that I felt I could add nothing new to what has been said, and said in a much better manner than I could expect or hope to do. Still, I thought perhaps my own experience and observations on the above-named subject might prove useful and bring about a good discussion, and at the same time be of service to many. But seeing this is my maiden effort in this direction, I trust you will kindly extend to me the customary forbearance under such circumstances.

Of course, the question of stopped ascension pipes is nothing new, as many present know to their cost, though I have heard of managers who say they never knew what a stopped ascension pipe meant. In that case, I may venture to remark, their heats are low, their dips heavily sealed, and the make per ton of coal carbonized not good. This subject has engaged the minds and attentions of managers, in this country, America, and elsewhere, ever since the introduction of gas lighting; and I am not sure that anything of importance has been added to our common stock of information for the last 20 years. Consequently I think I need offer no apology for taking up a subject which has received as much attention as, if not more than, many of the other subjects we as managers have to contend with, yet without having arrived at any very definite results.

I do not think it necessary to burden my paper, and weary you, with all the schemes that have been put into practice to overcome this trouble; but I may be pardoned if I mention a few of them. We are all acquainted with the last shovelful of damp coal placed on the mouthpiece; the old pot of water or fat placed just inside the mouthpiece; the trickling of cold water down the ascension pipe both inside and out; the casting of the first length of the ascension pipe with a water-jacket, causing a stream of water under pressure to circulate around, and pass off above, and so keep the ascension pipe cold; the introduction of light steel pipes in the place of the rough, uneven cast pipes; making the mouthpiece longer, and so causing the ascension pipe to stand farther away from the front of the sets, and heightening it; the building of thick walls to the front of the settings; and, finally, Mr. Eveson's patent compound, which we are assured is an infallible cure for stopped pipes.

Like the quack one sometimes sees in our small market towns, I have another preventative, which I, of course, consider better than any of those mentioned; and, though I have reasen to think something on the same lines has been tried before, still I claim to be the first to introduce, in a workable form, a perforated drum. It is now something like 20 years ago since we were troubled very much with stopped ascension pipes at the Ebbw Vale Gas Works, where we worked with high heats. I suggested to my father (who was then Manager there) that we should introduce a light wrought iron drum, thickly perforated with holes on all sides; and I attempted to prove to him the benefits that would most assuredly arise from the use of such an apparatus placed in the mouthpieces, just beyond the gas outlet. It was all to no purpose, for my respected parent would have none of it. It was nct until last winter, when driven to my wit's end with stopped ascension pipes, that I was determined to put into practice my old hobby; and this, I am glad to tell you, proved far more successful than I had ever anticipated. At Willenhall, I may mention, our hydraulic mains are three in number; two of them being 43 feet each in length, and the third 33 feet. Now, you will be better able to follow me, and see how difficult it is to do good work under such circumstances, when I tell you that, in going through the matter of levelling these mains a few months ago, we found that the first one of 43 feet was as much as 1¾ inches out of level—the middle of the main being up, and the two ends low. The second of the same length had gone down in the middle, owing to subsidence of the foundations by 1½ inches; so that in this case the middle of the main was down and the two ends up. This caused a good many of the dips to be only lightly sealed, while others were equally heavy; and so I found that the light sealed dips had brought about the mischief. To improve matters, my stokers positively refused to go on the top of the beds, contending that it was no part of their duty to jump pipes, although they had always attended to these matters before the adoption of the eight-hour shift. It was when I found the stokers thus indifferent to stopped pipes, that I felt something must be done, as the expense of keeping yard laborers to do the work was too much to entertain.

We are told, and I know that among many managers a strong belief exists, that the trouble of stopped pipes arises from certain kinds of coal; but I cannot say that I am one of them. All my experience tends to show that the trouble is not so much in the coal as in the high heats and the uneven seals in the hydraulic main, or when working anti-dips, although opinions upon this theory are widely divergent. But to proceed, I will here describe briefly my perforated drum (or disc), though I may say that I have not finally resolved upon the internal construction of the drum. At present, the drum is made of light sheet iron, thickly perforated on all sides with holes, and about 9 to 10 inches deep, made slightly less than the diameter of the mouthpiece, to allow for expansion and freedom of working when putting in or taking out, and also tapering a little. As before mentioned, it is placed in the mouthpiece just beyond the gas outlet. Now, with regard to its action. It will be apparent to all that the drum thus acts as a kind of hollow partition splitting up into numerous streams the gas as it is made, and preventing it from directly impinging upon the mouthpiece. By this means, I find the high temperature of the mouthpiece and ascension pipe is reduced in a most marked degree; and by the free use of the drum in the way described, it effectually overcomes the difficulty of stopped pipes, and the formation of thick tar in the hydraulic main. This, of course, is a very simple arrangement; and there is no scope for any elaborate description of details. But, as a rule, simplicity of action gives rise to more genuine and lasting results than very complicated mechanism; and often the simplicity of the agent astonishes one that it has not been found out or tried previously, especially when one sees the great changes that frequently follow from an apparently trifling idea.

I do not claim for this invention or cure that, if the ascension pipe is stopped up already, the drum will clear it. No! "Prevention is better than cure," even with regard to this matter; and the usual method of clearing must first of all be gone through—that, is, the auger has to be introduced, and a small passage made. Then, by the continued use of the drum, the pipes will be kept perfectly free. Perhaps the first thought that naturally strikes one is the trouble of always inserting the drum. But, on the other hand, it does away altogether with the heavy labor of jumping pipes, to say nothing of the loss and annoyance of the pipes being stopped. By the light labor of the insertion of the drum, it is a clear saving of labor, and will be recognized as such by the stoker after a fair trial. The results, too, that are, and can be, obtained from the continued use of the drum, were to myself somewhat surprising, and opened up to my view quite a field of inquiry.

I will now proceed to enumerate some of the advantages realized by the drum, and will deal with them *seriatim:* (1) It prevents any stoppage in the ascension pipes, and leaves them perfectly clear; and I may say here that this broad statement of fact is the result of my own personal experience from at least twelve months' steady working, and a careful and incessant experiment upon, and study of, the question. (2) It naturally follows that, as the pipes are kept open by the drum, a decided improvement in the make of gas is effected. This, too, I have verified to my own satisfaction, and am able to give statistics in proof, which, I trust, will demonstrate the fact to you. For instance, I have taken, as a simple illustration, the carbonizing account for the months of September, 1891 and 1892—with the same amount of coal carbonized—with the drum in and without it (though any other month would show the same result). In September, 1891, the quantity of coal used was 317 tons, and the amount of gas made 3,195,000 cubic feet; while in September, 1892, from the same quantity of coal, 3,392,000 cubic feet were made—being an increase of 197,000 cubic feet, which is equal to 6 per cent. (3) I find that, when the drums are in use, the heat is retained more in the retorts, and consequently better working heats are obtained. The coal, too, being more thoroughly carbonized, and also carbonized *close up* to the mouthpiece, a brighter, firmer, and more salable quality of coke in every way is produced. Besides, the coke in the front of the retort is as good as that in any other part, with less small in it after being thrown down or stacked.

By drilling holes in the mouthpiece and ascension pipe, and taking readings of the temperature by the aid of one of Bailey's improved ad-

justable pyrometers, I am able to give you the following average results of extended hourly readings with and without the drum in use. For instance, I took a bed of retorts that are at what I consider a "good heat," and found, on taking the readings at the end of each hour from the time the charge was put in, the average reading was 427° F. I took the readings in this way: The holes were all 1 inch in diameter; and, in the case of the mouthpiece, it was made on the side about 10 inches from the lid. The hourly readings in the order taken were as follows: 510°, 375°, 250°, 525°, and 475°; or, as stated above, an average of 427°. The second hole was made in the ascension pipe 2 feet from the center of the retort; and the average at this point stood at 290° for five hourly readings. I have the hourly readings by me, if members wish to know them; but I leave them out for simplification. The third hole was made still higher up in the ascension pipe—viz., 5½ feet from center of mouthpiece. The average readings at this point were 240°. All these readings are without the drum.

I will now give the average results of many readings of temperature made in a similar manner, but with the drum at work; and you will kindly note the figures, which are, under the circumstances, very interesting. The average heat at the hole in the mouthpiece (the same distance in every case as mentioned above) was 478°, or an increase of 50°. The five hourly readings were: 510°, 525°, 430°, 475°, and 450°. The average for the second hole (which, you will remember, was 2 feet from the center of the retort) was only 242°, or a decrease of nearly 50° as compared with the readings at the same point without the drum; while the average reading at the third hole in the ascension pipe (which was 5½ feet from the center of the retort mouthpiece) was only 131°, or a remarkable decrease of nearly 110°. The mouthpiece readings prove conclusively to my mind the opinion I have formed, and which is the statement I have previously made—viz., that the internal heats of the retorts with the drum at work were higher; while the low readings of the ascension pipe confirmed most conclusively my earlier experience and ideas that the temperature of the ascensions was decreased, and that this was the agency that prevented the drying up of those elements in the crude gas, during the passage to the hydraulic main, which, with the higher temperatures that exist in the ascensions under ordinary circumstances, is the principal cause, in my opinion, of the great inconvenience and loss in stopped pipes.

	Without Drums.			With Drums.		
Hours in Use.	Temperature at Mouthpiece.	Temperature in Ascension Pipe.		Temperature at Mouthpiece.	Temperature in Ascension Pipe.	
		1st Hole.	2d Hole.		1st Hole.	2d Hole.
1	510°	475° ..	465°	510°	285° ..	160°
2	375°	325° ..	275°	525°	275° ..	180°
3	250°	200° ..	170°	430°	250° ..	140°
4	325°	225° ..	140°	475°	250° ..	100°
5	475°	225° ..	150°	450°	150° ..	75°
—	2,135°	1,450°	.. 1,200°	2,390°	1,210° ..	655°
Averages.	427°	290° ..	240°	478°	242° ..	131°

Average difference in temperature with drums: At mouthpiece, +50°; at first hole in ascension pipe, —48°; at second ditto, —109°.

In addition to the advantages already mentioned as resulting from the use of the drum, there is another which I was quick to notice, and careful trials proved its correctness—(4) That there is a saving in the fuel account. I will instance this. My fuel account stands at 30 lbs. of coke per 100 lbs. of coal carbonized, which is not high, when you take into consideration that our settings consist of 16 inch and 15-inch retorts, in beds of fives, with only 2 cwt. charges. This account I was able to reduce during a whole week's test to 23 lbs. per 100 lbs. of coal carbonized, or equal to 7 pounds. With this amount of fuel used, I was compelled, owing to the increased heats, to work with less draught. A still further benefit is (5) that there are less signs of any approach to scurf or carbon in the retorts; and the illuminating power of the gas is well maintained.

In conclusion, gentlemen, I now leave this matter in your hands for your kindly criticism; and if I have, through inexperience, not made myself clear, I shall be glad to reply to the extent of my ability to any question that may arise. If any members would care to see the drums at work at any time, I shall be only too pleased to meet them at Willenhall, as well as to give any information they may require with regard to a question that has proved so beneficial to myself, and that has given me so much pleasure and many surprises while carrying out my experiments, under difficulties, to a measure of success that I did not dream of; and nothing can diminish my opinion as to the value and practicability of the drum, as it has been firmly fixed in my mind by the twin teachers Experiment and Experience.

Discussion.

Mr. Annan asked if the drums did not become warped with the heat.

Mr. Jones replied that they did not; they retained their form. In reply to another question, he said the only deposit he found was a little free carbon on the front. He had had the holes in the later ones he used made larger than in those he first employed. Under no circumstances had he had a stopped ascension-pipe since he had adopted them. The coal he carbonized was North Staffordshire.

Mr. Hack said he was sure the members were all very thankful to anyone who would bring something forward to do away with the frightful evil of stopped pipes. As to Eveson's patent compound, which was to be an "infallible cure," it was of no use whatever. With regard to the length of the hydraulic main, he had himself experienced the trouble of the pipes getting out of level owing to the contraction of the retort-bench. He had overcome this, however, by reducing the main but the best way was to observe the difference of level owing to the heat, and take note of it when resetting the retorts. They kept the mains level by allowing for the effect of temperature before they started. Some time ago a process was patented for putting a plate in the mouthpiece, just beyond the ascension-pipe; a space of two or three inches being allowed from the retort to the plate. The effect was to cause the current of gas to dip, and pass under the plate, before it went into the pipe, thus keeping the gas cool; and they found it was pretty nearly a cure for stoppages. The men, however, knocked the plates about a great deal; and the expense of repairing the damage was so great as to cause them to discontinue their use.

Mr. J. S. Reeves (Bilston) said that he should like to ask Mr. Jones what useful purpose was served by having so my holes on the side of the drum. It seemed to him that a good many of them would be of very little use. He had not seen the apparatus before; but it forcibly reminded him of the fact that, at one of the meetings of the British Association of Gas Managers, a grid was introduced, and the bars of the louvre were so placed as to throw the gas downwards, and they could put them in such a position as to intercept the gas on its way to the ascension pipe. The same results would be obtained by this as by Mr. Jones' method; and, in appearance, the louvre bars had the advantage of simplicity. The effect of the gas striking on the grids was that there was a great deposit of carbon, which could be removed by a brush. He was not himself much troubled with stopped pipes; but where they had a good many, it might justify the adoption of the system.

Mr. Hunt said there was no doubt that whatever tended to lower the temperature of the gas when it entered the ascension pipe would reduce the difficulty arising from stoppages. Some years ago, he applied a water-jacket to the pipes with this object; and in nine cases out of ten, it effected a cure. There was nothing original in it, as it was applied about twenty years ago; but, for some reason or other, it had lost its charm. He had been puzzling himself with Mr. Jones's figures; and he did not see how his appliance could reduce the temperature of the gas, because at the mouthpiece it was about the same. It was only at the second hole that there was a very appreciable falling off. It would have been very useful if Mr. Jones had carried the experiment further, and inserted a thermometer in the bottom of the mouthpiece; because he assumed that, if the arrangement really lowered the temperature of the gas in the ascension-pipe, it was brought down before the gas entered the pipe, owing to the gas impinging upon the interior surface of the mouthpiece. Mr. Reeves had mentioned that the plan before them reminded him of the arrangement devised by Mr. Vincent, and introduced to the British Association of Gas Managers in 1874 by a namesake of Mr. Jones—viz., a grid to be put into the retort; so that evidently there was something in the idea. What they wanted to find out was in what manner it really operated. If it acted as a cooler, how was the effect produced? If Mr. Jones could throw any light on this point, he (Mr. Hunt) would be very pleased.

Mr. J. S. Cranmer (Stratford-on-Avon) said he once adopted baffle-plates—using about five. He found that they prevented stoppages in the ascension-pipes; but he had a serious increase in the accumulation of carbon. He should therefore like to ask Mr. Jones if he had experienced similar results.

Mr. Bell said he was one of those who had been troubled with blocked pipes; and he found a cure in taking the tar out of the hydraulic main. He worked with high heats, and was not now troubled with stoppages. With regard to a remark which had been made that those who worked light seals were troubled with obstructed pipes, he himself found the contrary to be the case. His experience was that, where stopped pipes

were met with, it was by the hydraulic main getting full of tarry mat-

Like Mr. Hunt, he was rather at a loss to understand all the effects produced by Mr. Jones's drums—how they would increase the make of gas or reduce the tar.

Mr. Annan said he should like to ask Mr. Jones if his mouthpieces were longer than usual; because he failed to see how, if the drum were employed in the mouthpiece of the retort, and especially if it were placed further in, it could escape being very quickly burnt out. He supposed Mr. Jones had not yet begun to work generators, or he would have found that when he brought up the heat to the proper degree it would twist his drums in all directions. In works where there were only a few stokers, and these not fully employed, they might be troubled with the drums; but if they were taken into large works, where would they find stokers to attend to them? If Mr. Jones could make something that would last, there might be some use in it.

Mr. J. A. Harris (Wigston) said he claimed to work with high heats; and his average production of gas was 11,160 cubic feet per ton of coal. He had not a single stopped pipe all last winter. He changed the coal, and then he was troubled with them at once. He believed there must be something in that.

Mr. J. C. Belton (Wellington) said he should like to ask Mr. Jones what was the size of his ascension pipes, and whether or not they were straight. About six years ago, when he succeeded to the management of the Wellington gas works, the ascension pipes were tapered. They were 5 inches in diameter at the bottom, and 4 inches at the top. He then had a large number of stoppages. He had taken away the tapered pipes and put in their place pipes which were 6 inches in diameter from the mouth to the top, and he had scarcely had an obstruction since. It appeared to him that the stoppages had not so much to do with the coal employed as was supposed. When using Yorkshire coal, they had as many stopped pipes as with North Wales coal. He attributed the freedom from trouble to the alteration in the size of the pipes.

Mr. S. H. Millard (Hinckley) said one point which struck him was the almost phenomenal reduction of temperature with the use of the drums. He should be inclined to say that it was not a lowering of the temperature of the gas, but simply that the globules of tar were not allowed to go forward, and get on the the thermometer used for taking the temperature. If the solid matters were carried forward and collected on the thermometer, they would record a rise of temperature. He questioned if the temperature of the gas itself was reduced, as Mr. Jones had stated.

Mr. T. Cross (Cannock) said he understood Mr. Jones to say that the drum was 1 inch smaller than the retort; and he wished to know if there was not room for the gas to get away by passing over it. How did the gas get through the holes in the drum if it had room to pass around it?

Mr. W. R. Cooper (Banbury) said Mr. Jones had alluded to the variation of dip. What dip did he work with, he asked, and how could he explain the fuel account being reduced, and the quantity of gas increased?

Mr. Jones, in reply, said Mr. Bell had inquired if there were any variation in the coal to account for the better results he had obtained. To this he could answer that during the whole of the time he was dealing with this question and making the necessary experiments, there was no change in the coal contracts. Mr. Young had asked whether there was any alteration in the settings which could be put down as one of the causes of the improvement in the make of gas. He was afraid that he had not stated anything to this effect in the paper; but he could assure the members that there was no change in the settings, and therefore they could have nothing whatever to do with the improvement in the make. Still, he thought it a fair inquiry, seeing that he had not mentioned the fact. With regard to Mr. Reeve's question as to why holes were placed in the sides of the drum, the reasons were obvious. They were, first, to lighten the weight of the drum; and, secondly, to insure better working. For instance, if the face of the drum should become partially obstructed with solid particles of carbon, the holes in the side would act as a relief to the proper passage of the gas. Mr. Hunt had inquired how he (Mr. Jones) accounted for the great reduction in the heat of the lid, cross-bars, and surroundings, when the retort was so hot, and being so near the mouthpiece, too. Seeing that the drum acted as a hollow partition, and the front disc received all the first heat from the retort, naturally this left less heat for the middle and back discs of the drum to stand—in fact, the back disc never exceeded a dark red heat. Therefore, as the lid and cross-bar, etc., were still further away, in his opinion this accounted for the great reduction in the heat of which he had spoken. The temperature of the cross-bar was so much reduced that anyone could, by putting his hands upon the different fittings of the lid, tell by the temperature which retort contained the drum. Mr. Cranmer wished to know whether there was not an increased deposit of carbon in the retorts. To this he must again affirm that, during the time of his experiments, he did not notice any increase. Besides, by the action of the drum, the pipes were constantly kept open; and therefore they allowed free egress for the gas as it was made, so that there was certainly less opportunity for the carbon to form. He was told that stopped pipes arose through working with high heats and light seals; but he worked with high heats and light seals, and yet had no stopped pipes. Mr. Bell's experience was not similar to his own; and he should still adhere to the opinion he had expressed—viz., that high heats and uneven seals were the *main* cause of stopped pipes. Mr. Annan asked the length of his mouthpieces, and the heats he worked at; and he also expressed the opinion that the drums were too frail to stand the rough usage of the retort-house. The mouthpieces he employed were comparatively short ones; being only 14 inches long, and this he was of opinion was much too short. With reference to the heats, without wishing to appear vain, he should like the members to examine his coke hearth; and this would show, better perhaps than anything else, the sort of heats there had been. As to the lightness of the drum, he might say that he had several which had been in use for the last six months; and he found that, by coating them with lime-wash, they were protected from the heat, and lasted much longer. Mr. Belton had put a question as to the length and the size of the ascension-pipes. They were 5 inches in diameter and 10 feet 6 inches long. Mr. Millard wanted to know whether he (Mr. Jones) noticed any difference in the globules of tar deposited on the leg of the pyrometer at the different stages of the experiments. To this he must certainly admit that he had failed to notice it, as his attention was more particularly drawn to the other end of the pyrometer. With references to an inquiry by Mr. Cross, in theory it made no material difference as to the drum fitting tight, but in practice it needed to be narrowed; as, though the gas did escape round the sides, the largest portion passed through the front disc, and was thus split up into streams in its rush to the ascension-pipe. If not reduced, the drum would wedge when heated. In answer to Mr. Cooper, as a rule, they worked with a 1-inch seal, but during the whole of the summer months, with 3 10ths only. Allowing ½-inch pressure for exhausting through one of Kirkham, Hulett and Chandler's washers, this would make in all 8-10ths. Owing, however, to small mains, etc., he had to increase this to 1½ inches in the engine-house during the winter months.

The President—When you tested without the drum, did you notice whether there was a large deposit of tar?

Mr. Jones—Yes.

The President—And was there much deposit with the drum in?

Mr. Jones—I cannot say there was any difference whatever. In reply to Mr. Cooper, I may remark that during the whole summer my seals were less than an inch. The gauge in the engine house indicated 3–10ths to 4–10ths. I have a 1-inch dip in the main.

Mr. Belton said he should like to know how Mr. Jones could account for his increased heats when he claimed a 25 per cent. reduction of fuel.

Mr. Jones said it might be accounted for from the fact that though it was considered necessary, in putting up single beds of retorts, to protect them with thick walls at the back, yet there was nothing but a quarter or three eighth inch plate at the mouthpiece; and this was where the heat ran away. The retort was white hot up to the flange; but this was not the case in the retort adjoining it. There was no smoke.

Electric Light and Gas.

Engineering, in a "note" on this subject, remarks that the erection of numerous large electric central stations has naturally brought the respective merits of gas and electricity for lighting purposes to the fore, as well as the question of what effect the increased adoption of the latter is likely to have upon the consumption of the former. As a rule, however, the consumption of gas is steadily increasing, notwithstanding the more general adoption of electric light. In Stockholm, for instance, the increase in the consumption of gas in the year 1888, when 14,000 incandescent, and about 250 arc lamps were in use, amounted to more than 6½ per cent., a state of affairs which still exists, although electric light has in the meantime become much more general. In Berlin, where the central station alone feeds some 100,000 lamps, in addition to numerous private installations, the increase in the consumption of gas has of late years been steady. During the financial year 1888–89, for instance, the private consumption of gas rose 7½ per cent., although the number of electric lamps was doubled during the same period, a fact which becomes still more remarkable when it is pointed

out that the increase in the gas consumption was largest (about 10 per cent.) in the central parts of the town, which were nearest to the electric installations. Under these circumstances the corporation of Berlin decided to build a fifth gas works, calculated for a maximum production of not less than 12,400,000 cubic feet per day. At about the same time Hamburg expended $750,000 in the extension of one of its gas works, although at the same time an electric central station for 20,000 lamps was being built. In Leipsic the old gas works have been extended and the new ones doubled, simultaneously with the erection of several important electric installations. At Elberfeld, a manufacturing town of a little more than 100,000 inhabitants, the consumption of gas is increasing, although there is a central electric station of 7,000 lamps capacity. The same is the case at Muhlhausen. At Darmstadt, with only 50,000 inhabitants, the gas works were taxed to the utmost of their capacity; an electric central station for 4,000 lamps was, therefore, built, but the gas works have since had to be extended. At Lubeck there was, to begin with, a decline in the consumption of gas after the central electric station of 2,600 lamps had begun operations, but this did not continue for more than a year, and since then the consumption of gas has been steadily increasing. In Gothenburg electric light has been adopted to an unusual extent, and is constantly increasing, but still the consumption of gas becomes larger every year, and a new gas works has been built. Of course it is improbable that a continued increase of electric lighting will also for the future be attended by a larger consumption of gas, yet there is no reason to anticipate any marked decadence as far as gas is concerned; for along with its original use for lighting purposes, gas is every day applied more and more to heating and industrial purposes.

SPECIAL ENGLISH CORRESPONDENCE.

COMMUNICATED BY NORTON H. HUMPHRYS.

SALISBURY, November 10, 1892.

Oil Gas.—Gas Matters at Belfast.—A Deputation of Gas Engine Owners.—Wright's "Coal Gas and its Uses."—Strikes amongst Gas Consumers.

The question of utilizing oil and fluid hydrocarbons generally for the production of illuminating gas has occupied a great deal of attention in Scotland for some time. This is due to two causes. First class cannels are becoming more and more scarce, year by year; and only this quality of coal is suitable for the production of high power gas as usually supplied in Scotland. A few towns, chiefly those in which the gas works are owned by the public authorities, have sought to meet this difficulty by lowering the quality. It is a matter of frequent remark that Scottish towns, with 26 to 28 candle gas, do not present a more luminous appearance at night than English towns with 18-candle gas. But at the same time there is the fact that pipes and fittings used for passing a none too liberal supply of 28 candle gas are not likely to prove a success when adapted to 22-candle gas, and many users of gas look upon larger pipes and burners as a device of the evil one. The other cause is the languishing condition of the Scottish paraffine oil trade, due to the competition of American and Russian petroleums. The Edinburgh Gas Commissioners have, at the instance of one of their body, a Mr. Wells, undertaken a long series of practical trials, without arriving at any particular result. But something more has been done, if rumor is correct, at Peebles, where experiments on the enrichment of coal gas by means of mineral oils have been carried on by Mr. W. Young, a gentleman who has been known for many years past as an inventor and patentee in connection with the destructive distillation of shales. Mr. Young has made important contributions to the literature of illuminating gas, chiefly by the medium of papers read at meetings of Scotch Associations of Gas Managers. So that if anyone can do anything in this matter it would appear that Mr. Young is the man. The experiments at Peebles have been carried out under the practical superintendence of Mr. A. Bell, Jr., engineer to the gas company, a gentleman who, in 1889, directed attention to "The Presence of Sulphur in Mineral Oils,"* in a paper read before the North British Association of Gas Managers, and showed that some varieties of oil and petroleum contain more in the way of sulphur compounds than is ever present in coal gas, and, therefore, the popular idea that by using oil one could get rid of any unwholesome influences due to the presence of sulphur in coal gas, was a delusion and a snare. They have proved so far successful that a permanent plant has been erected, and the apparatus is said to constitute "a new departure" in gas making, the principle being different from usual methods of oil gas manufacture. Although very simple in character it produces very rich gas. The quality is so high, indeed, that it must be diluted with coal gas before it can be tested, and from experiments made on these lines it is estimated at 100 candle power. A mixture of about one part of the new gas to six of 20-candle coal gas gave an illuminating value of nearly 31 candles. The lighting value per gallon of hydrocarbon used is higher than that secured by burning the oil in a duplex lamp, and there is little residual beyond pure carbon, which is obtained at the rate of about 2 pounds per gallon of material used. The fact that the oil, *minus* more than one-fourth of its carbon, can be made to yield a greater value than before, is a striking commentary on the fact that the illuminating value of a gas is not proportional to the quantity of carbon present in it, which was elegantly illustrated by actual experiment in one of the lectures above referred to. Some people make "new departures" in a very light and airy way, but when men like Messrs. Young and Bell do so there is usually something substantial behind, and so I expect to have more to say about this matter before long.

Public feeling seems to be running rather high at Belfast in the matter of extending the gas works. The question has been before the Town Council, who are the proprietors of the gas works, and appear to have accumulated a substantial pile of surplus profits therefrom, for some time, and several reports have been prepared on the question. No amount of talking or reporting, however, will get rid of the fact that the gas consumption is increasing, and that the plant at the command of Mr. Stelfox, the gas engineer to the Corporation, is already overtaxed. The real difficulty appears to be that the existing gas works has got into bad odor, both actually and metaphorically, with the neighboring residents; and consequently, whenever a site is pitched upon for the new works, the owners of property in the locality selected are up in arms. Instead of facing the difficulty by obtaining accurate information, these people appear to resort to advocates of new processes, or to astounding paragraphs that go the round of the popular "technical" journals, which aim at giving instruction about anything and everything, with the usual results on the minds of readers who go in for superficial and astounding, rather than plain and practical knowledge. So there is a great deal of talk about water gas, electric light, etc., as a means of shelving the difficulty. Incidentally I may mention that according to an official statement the Corporation have erected water gas plant equal to the production of a million and a half cubic feet per diem. But they do not rely upon this system as a means of avoiding the need for extension. They have also decided to carry on an electric light installation capable of supplying 10,000 lights, and at the meeting at which this resolution was arrived at two amendments proposing 50,000 and 25,000 lights respectively were decisively rejected. Personal feeling appears to enter to a great extent into public affairs in Ireland. At Dublin there is almost constant disputing between the Town Council and the gas company. Similarly, at Belfast, a speaker at a public meeting of ratepayers characterized the Gas Committee as reactionary and illiberal, and insisted that if the electric light was to have a fair trial, neither they nor their engineer must have anything to do with it. This sort of thing will neither save the public money nor put more pressure in the public gas mains. It is to be hoped that matters will have quieted down a little before the Gas Institute meeting, which is to be held at Belfast next June.

It is an instructive sign of the times to read in the papers about a "deputation of gas engine owners" appearing before the manager of a gas company with a view of securing the best possible terms. The increasing sale of gas, which has been a remarkable feature for some years, has been largely assisted by the adoption of gas engines of larger size than formerly. When the gas engine was first put on the market, it was introduced as a useful help for small users of power. A 2-horse power nominal was considered a respectable size, and a 4-horse power was talked of as a "large" engine. But of late years engines of all sizes, up to 50-horse power, have been adopted. It is no uncommon thing for a factory to be run from a gas engine of such capacity. I need not point out that the putting in of an electric light installation, having the power supplied by a gas engine, to premises at present lighted with gas, is a gain to the gas suppliers and not a loss. More, rather than less, gas will be used; and if accumulators are included in the system, the gas will be taken during the day, and not at the time of maximum consumption. In most cases gas engines can be added to the consumption without affecting the important question of storage. In addition to engines, gas is being adopted for various technical purposes, a line which also presents the advantage just named. I have just laid on a supply of gas for heating an ordinary baker's oven, which will represent a steady all-the year-round consumption of about 3,000 cubic feet per week, and be more advantageous to the company than a large church, hall or factory, where the consumption is only for a few hours at a time at the darkest season of the year. The demand for gas heating

* See JOURNAL, Aug. 19, 1889, p. 235.

stoves and gas fires is also well maintained this autumn. Amongst other directions in which the use of gas is advancing, regenerator lamps may be named, especially for the exterior lighting of shop windows.

As an example of the enterprise exhibited by our manufacturers of gas apparatus, I may mention the neat octavo volume which the well known firm of Messrs. John Wright & Co., of Birmingham and London, have been issuing to their customers. It is in no sense a catalogue, but a simply written gas consumers' guide, containing plain instructions on such subjects as meters and service pipes, pressure, leakage, how to read the meter, products of combustion in regard to ventilation, gas cooking stoves of all kinds, heating stoves and gas fires, gas engines, various tables, etc. There are numerous illustrations, and the contents extend to over 200 pages. The author, Mr. J. F. Wright, recommends it to the careful consideration of all who pay gas bills, and it may also be consulted with advantage by all who have dealings with gas consumers. Anything likely to arouse interest and direct attention to efficient and economical uses of gas is to be commended, and many of my friends are speaking highly of the work.

The mania for "striking," which seemed to seize so strongly upon wage earning classes in this country, the general effect of which is that while higher wages are in some cases secured, it has only been done by a permanent sacrifice of business that has gone to our foreign competitors, has not touched gas consumers. But in France things are different, and I hear that at one or two important towns the consumers are discontinuing the use of gas until their demands for a reduction in price are complied with. The petroleum lamp is, of course, to be the means of supplying lighting material. In France the gas companies believe in good dividends with substantial business in addition; the municipal authorities hold with heavy duties in the form of rents for the use of the public roads, money payments for the right to supply gas, and even an actual barefaced commission based on the sales or on the surplus profits. Under such circumstances it is no wonder that the consumers find it desirable to resort to combinations and other extreme measures. As our laboring classes are now finding, so the French gas suppliers will find that of the petroleum lamps introduced at a pinch, some will remain in permanent use, and that business once lost is never entirely regained.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

THE following graphic account of the experience of the Milwaukee (Wis.) Gas Light Company during the recent disastrous conflagration at that point is from the Company's Engineer and Superintendent, Mr. Ed. G. Cowdery:

MILWAUKEE, Nov. 15th, 1892.

To the Editor AMERICAN GAS LIGHT JOURNAL: I expect you are impatient over my long delay in giving you an account of the Milwaukee fire, but the truth is I have had so much on my hands during the last fortnight that the delay was unavoidable. I was in Baltimore at the time of the fire, and got my first report of it from the papers in that city. In order to get speedily at the details of how much or how little damage was done, I resorted to the long distance telephone line making connections with Milwaukee. On account of the fire the connection was poor between Milwaukee and Chicago, so the conversation between those two points was very indistinct, but the transmission from Chicago to Baltimore, and vice versa, was all that could be desired. It seems that the fire started at the corner of Detroit and East Water streets, which point is three blocks north and two blocks west of our northwest corner—our plant being about two blocks long and two blocks wide. The wind was blowing a gale from the west, and after the fire had spread a block from where it started, it reached a lot of one and two story frame buildings, located closely together, and, of course, made very rapid progress, eastward, towards the Lake. It seems that, although the wind was blowing a very strong gale from a general westerly direction, it shifted somewhat, and when the fire reached the Lake, the flames traveled very rapidly to the south, taking in everything from the east line of the gas works, east. It burned everything east of us, including a very large elevator and malt house directly across the street. One of our gasholders was on the same side of the street, to the east of our plant and north of this malt house. Directly north of the holder was a warehouse devoted to the barrelling and storing of carbon oils, and between the warehouse and the holder was a high pile of barrels, and to the east of the gasholder was another pile of barrels, owned by the same company. The two piles of empty barrels—aggregating 10,000—so close to the warehouse stored with filled barrels (every now and then one of these would explode) of course can easily make plain to you the great heat, and the great danger therefrom to our plant from that side. Our naphtha tanks are buried in the ground, east of Jefferson street, and east of the main portion of our works, and immediately south of this holder. These tanks (when full they hold about 55,000 gallons) at the time of the fire had about 40,000 gallons in them. Three of these tanks were covered with a frame, iron roofed house, as a sort of protection. The east end of this house was burned out. The largest tank of all had no protecting house over it, and to show in what near proximity to the fire this tank was I might say that the inlet and outlet valves to the pipe, which enter and come from the tank near the bottom, were surrounded by wooden boxes, coming to the surface of the ground, to enable us to get at these valves to open and close them, and the fire completely burned these boxes to the natural water line—which is two or three feet underground—but none of the naphtha in any of the tanks took fire or was disturbed in any way. An unloaded oil tank that stood on our track adjoining the storage house disappeared, and for quite a while we did not know whether it took unto itself wings or whether the Railroad Company took it away. We have heard since that the railroad people captured it. The holder, which was in this proximity to so much fire, was about two sheets high, and it seems at the time the men at the works had so much to attend to that the holder was allowed to stand at that height. Among the many wonderful things that happened during this conflagration, it certainly was one of them that that holder came out without any damage, save the blistering of the paint on the two sheets next the fire. The fire to the east had nearly spent itself before the fire reached the works from the two other sides. After the greatest danger of the fire to the east was over, the block north of us was on fire and burned—the wind was blowing so strong from the west at this time that the fence on our north side was hardly scorched. When the block north was about one-half burned out, the block west took fire, and when that was about one-half burned over a large distillery or vinegar factory on the opposite northwest corner from the northwest corner of our works took fire. The flames in this distillery building were very hot, and it was from this source that the gas works received its greatest damage. Our largest holder was on the corner opposite this distillery, but by putting full pressure on the street (the manufacturing department was shut down early in the progress of the fire), and the holder, luckily, being very low anyway, was quickly sunk, so that the main damage to it was the blistering of the paint. Immediately south of this was our new Wilkinson plant, adjoining which on the south was a frame shed, roofed with corrugated iron—our barn was located in this shed. The fire was so intensely hot here that the men could not save the shed, and it was completely destroyed. This shed being connected with the water gas building, naturally communicated fire to the latter, and the doors and windows on that side of the main structure were consumed. The plant, of course, was exceedingly well constructed, being almost fireproof—that is, it contained no woodwork except the window frames and doors, and a few beams which had been used to support the conveyer on the top of the elevated coal bins. The condensing room to the plant had a wooden truss roof covered with boards, which, in turn, were covered with tin. This woodwork was consumed—truss, boards, and all—leaving nothing but the tin, which remained in the condition it was before the fire. In order that you may make a fair estimate of the intensity of the heat that swept this plant, I have only to say that the joints on all the pipe work, flange and hub, burned out so that it will be necessary to take apart every gas pipe and make a new joint. I cannot add more to show you how close the plant of the Milwaukee Gas Light Company was to total destruction. Indeed, it can only be realized by one who was on the ground, studied the conditions, and noted what happened. It is perfectly wonderful to see how everything—brick and frame, north, east, and west of our plant—was leveled flat to the ground; and it looks a vast extent of prairie now. It is to be said to the credit of the foreman of our works that he staid by the plant watching the progress of the flames, although he knew that his home was in the path of the fire, that it must have burned up, and did not know where his family were or what had become of them. It so happened that all the engines were located where the fire first broke out, and the flames made so much greater progress than the engines could that they were completely shut off from that part of the afflicted territory in which is located our works. The foreman gathered some half dozen men, who, equipped with pails, acted as a fire corps with much efficiency, applying the water at the right time and at the right place. Their efforts, no doubt, saved the plant from much greater destruction, and enabled us to start up in a few days, instead of many weeks, or months, later. In recognition of his efforts the Company presented him with a gold watch, suitably engraved, and a chain, and at the same time gave him $500 for the loss of his furniture. In the same spirit the Company gave every married man $100. I should have

stated that an old brick building (unused for gas making purposes, but used as a storehouse) on the northeast corner of our works was entirely burned out. It was of no great value, and the Company did not materially feel its loss. However, it was only 2 feet or so from our hydrogen holder, built by Messrs. Bartlett, Hayward & Co. two years ago for the storing of hydrogen in connection with our Wilkinson plant. It was in a steel tank above ground, and its capacity is about 100,000 cubic feet. It was not cupped, but the upper section was about full, and so stood through the fire. Of course, as the burning building was only from 2 to 2½ feet away, the heat was tremendous upon the holder and sprung the cup of the lower section and the top curb of the upper section, and warped the sheets, leaving all the joints leaking to that side of the fire. One of the brick walls of the adjoining building broke a hole through the sheets of the lower section, but the holder is not beyond use, and we expect can be employed during the winter, or until we can "lay it up" a sufficient length of time next season to repair it. The coal gas plant, being a block south, was not touched by the fire at all, and we were thus enabled to start up early on Saturday, the day following the fire. The water gas plant was damaged to such an extent that we were unable to start it until the following Wednesday. We were at this time sending out about 2,000,000 cubic feet daily, and had coal gas benches under fire for a capacity of about 1,000,000 cubic feet, so that we were able, from Saturday on, to supply about 1,000,000 cubic feet to consumers who would naturally demand 2,000,000 cubic feet. The effect of this was that the high grounds got all the gas; the low parts only had a supply during the daytime or late in the evening—the immense draw toward the high grounds drew it all away from them during the early part of the evening. It will be interesting to know that we supplied gas all one evening, with two tenths vacuum at the works on the main. We carried insurance upon all portions of the works, so that the loss was fully covered, and the real loss to the Company will be but the little loss of business during the three or four days that we were either shut down or running at less than our capacity. Under the circumstances it seems that the Milwaukee Gas Light Company could not have come out of the fire in better shape. I hope this will make our standing fairly clear to your readers; but I must add that the account has been very hastily put together.

THE San Bernardino (Cal.) Gas Light Company is enlarging its electric lighting facilities.

AT the annual meeting of the Riverside (Cal.) Gas and Electric Light Company the following officers were chosen: Directors, W. A. Hoyt, P. K. Klinefelter, J. S. Castleman, J. H. D. Cox and B. F. Burt; President, W. A. Hoyt; Secretary and Treasurer, B. F. Burt. It was also decided to put up a new holder, rated to store 60,000 cubic feet, and it is likely that other important plant improvements will also be ordered.

THE following communication was recently forwarded to us, under date of November 17th, at Milwaukee, Wis., by Mr. Fred. Bredel:

To the Editor AMERICAN GAS LIGHT JOURNAL: On page 662 of your JOURNAL, in a discussion, I am quoted as saying: "You have to assort your coke, and to do it all by hand is very expensive, as you know, and involves an expense of as much as 1¼ or 1¾ cents per ton of crushed coke. Here you get your crushed coke practically for nothing." This must either have been a slip on my part or a mistake on the part of the stenographer. It ought to have been 1¼ to 1.3 cents per *bushel* of crushed coke, and not per ton.

OF course, we assume that Mr. Bredel is perfectly cognizant of the action taken by the Association at its last meeting, instructing the JOURNAL to print the reports *verbatim*, or as furnished us by the Association.

FOLLOWING our reference in the last issue of the JOURNAL to what the gas men at Hackensack, N. J., are doing, we print the following hints forwarded by "E. U. S.," under date of November 18th: "Dear JOURNAL: We have not been snowed under nor buried by any avalanches, but are just hustling—75 new consumers secured and about 70 gas stoves sold since last spring is a wonderful record for this old town. We have just completed the laying of about 1¼ miles of 4 and 3 inch pipe to the outlying suburb of Fairmount, and are now busy putting down 3,200 feet of 12 inch pipe from the works to Main street, replacing a 6 inch main. The latter will be relaid at another point. We also have enough work in the extension line laid out to keep us busy for a year. We advertise in all three of our local papers, changing the 'ads.' nearly every week, and we keep a stock of different styles of gas stoves in our show room, at the office, all connected up, in readiness to illustrate cooking or to display heating by gas. We have on hand a cargo of cannel coal —something that never came to this town in its prior history—and the result is that not only have we reduced our selling rates 20 per cent., but have also increased our candle power full 15 per cent. All of this goes to show that the new proprietors of the Company not only do mean business, but that they intend to keep up with the procession."

MISS EFFIE KIMBER, daughter of Mr. and Mrs. T. G. Lansden, of Washington, D. C., was united in marriage to Mr. Arthur H. Isbell, son of Mr. and Mrs. Charles W. Isbell, of this city, on Wednesday, November 16th. The ceremony was celebrated in Washington. Congratulations are in order over the fact that the gas fraternity seems to be getting more fraternal than ever—and that our sons and daughters are aiding the good work.

TO go back to the Hackensack affairs, it might be noted that a very conspicuous example of cooking by gas there is shown daily at the Susquehanna cafe, in the kitchen of which is installed a large gas range.

THE Berlin Iron Bridge Company, of East Berlin, Conn., has taken the contract for a new machine shop, to be built at Newport News, Va., for Messrs. E. C Hillyer & Co. The building will be 82 feet in width, divided into a central portion 40 feet between crane girder columns, with a wing on each side, 21 feet in width. The wings will be two stories high, the balcony floor to be used for light work. The central portion of the building will be controlled by a 20 ton travelling crane.

SPECIAL despatches to the daily *Press*, dated Reading, Pa., November 17, are to the effect that an interesting suit for damages terminated there in court that day, a non-suit being entered. It was the case of Annie M. Walk vs. The Consumers' Gas Company. The plaintiff who is the daughter of Benjamin Walk, whose residence is close to the works of the Company, claimed that the defendant maintained a leaky oil tank, from which the oil percolated through the earth into the cellar of the Walk residence, there producing a gaseous vapor, that, on exploding with violence, terribly burned and disfigured the plaintiff when she had been sent, carrying a lighted lamp, into the cellar for coal. Many witnesses were examined as to the condition of the tank, and after other testimony had been produced Judge Ermentrout ordered a nonsuit, on motion of the company's counsel. The Judge held that on account of the direct act of the mother of the child in sending the latter into the cellar with a lighted candle there can be no recovery, as the accident could have been averted had the mother exercised ordinary prudence, because she knew of the existence of the gas, for her husband had been pulled out of the cellar in an unconscious condition the day before. Judge Ermentrout said that while no contributory negligence could be attributed to a child of such tender age as the plaintiff, the negligent act of the parent was putative, and the parent could not shield herself under the plea that she had no idea any accident would happen.

SOME financial reports in connection with gas shares at different points are appended: The long looked for quarterly dividend on Bay State Gas, common, has been declared. It is at the rate of 4 per cent. per annum, and is payable on Thursday. Meanwhile the stock has moved up to 63¼.——A quarterly dividend of 1¼ per cent. has been declared on the preferred stock of the Laclede Gas Light Company, St. Louis, which is payable on December 15th.——W. S. Owen, of West Market street, York, Pa., recently offered at auction 20 shares in the York Gas Company. They were disposed of at 90 ——The following dividends were recently paid on gas shares largely held in San Francisco: Pacific Gas Improvement Company, 50 cents per share; San Francisco Gas Light Company, 35 cents per share; Central Gas Company, $1 per share.

THE proprietors of the Cambridge (Mass.) Gas Company have ordered a reduction in the gas rate, equivalent to a cut of 10 cents per 1,000 cubic feet, the same to take effect on January first. The gross price under the new schedule is put at $1.70 per 1,000, from which a rebate of 20 cents per 1,000 is allowed on all bills paid within 25 days of their dates.

A CORRESPONDENT forwards the following from Cleveland, Ohio, which explains itself: "L. A. Hubbard, a local druggist, was recently arrested on a charge of using illuminating gas and not paying for it, preferred by Mr. Beardslee, Secretary of the Cleveland Gas Light and Coke Company. Hubbard is the owner of a frame business block at 1476 Cedar avenue, and resides in one of the apartments thereof. There is a drug store below Hubbard's dwelling room which was occupied by him until about July 1, at which time he sold the drug stock and store fixtures to W. M. Fox, who came to the city from Detroit, Mich. The

storeroom and dwelling rooms have since been illuminated with some kind of gas, though there was no meter in the building, and Mr. Beardslee says that the gas was made by the Company of which he is Secretary. Mr. Hubbard conveyed the impression to his tenant and some of the neighbors that he himself manufactured the gas which has been used. Some time ago Secretary Beardslee was told about this domestic gas establishment, but his cynical mind did not receive the story as truth, and the result was that an investigation was begun, and it terminated in the issuance of a warrant. The Company asserts that Hubbard, or some one having access to the property, had connected the house and supply pipes where the meter had been (it was removed from Hubbard's cellar last March, because he refused to pay more than 60 cents per 1,000 for gas while the Company was rendering bills at $1 per 1,000) with a tube, cementing the connections with plaster of Paris. The offense charged is a statutory one, in which the penalty may be a fine in $250 and imprisonment for 30 days. Several prosecutions under the statute have been begun by the Peoples' Gas Company, but they were always compromised before trial. The Gas Company considers Mr. Fox, the occupier of the drug store, as an innocent user of the gas."

THE Common Council, of Duluth, Minn., has adopted a resolution giving 12 months' notice to the proprietors of the Duluth Gas and Water Company that the city would purchase the plant at the appraised value meanwhile returned. It is understood the the city has an available fund of $800,000 to be devoted to the purchase of the plant, which sum was voted at an election held for the purpose something like a year ago.

THE offices of the Natick (Mass.) Gas Light Company have been removed to room No 1, Clark's block, which is a much superior location to the old site on Sumner street.

THE Louisville (Ky.) Gas Company has determined to make important changes on its electric lighting plant.

MR. JOHN BREEDEN, the official gas inspector for Louisville, is a sensible, painstaking official, who maintains the dignity of his position by acting up to the duties of the same, so far as the public are concerned, without being blinded to the fact that the Louisville Gas Company has rights which are to be respected. He looks to be the right man in the right place.

AT the annual meeting of the Superior Water, Light and Power Company, of West Superior, Wis., the following officers were chosen: President, C. H. Wildner; Vice President, D. M. Watkins; General Manager, A. A. Cross. The dividend was passed.

A RECENT issue of the Trenton (N. J.) *Gazette* contained the following: "The Elizabethtown (N. J.) Gas Company, controlled by Mr. John Kean, Jr., has absorbed the Metropolitan Gas Company. The Metropolitan was sold a few days ago in New York to satisfy the claims of its creditors. John Kean, Jr., bid $50,000, it is said, for the plant, and then stopped bidding. The bidding continued until $187,000 was reached, when it ceased and the plant was declared sold. The purchaser was the Receiver who had been operating the Company, and he then turned it over to Mr. Kean. It is estimated that the plant is worth $487,000. The Consolidated Company will be governed by the following Board of Directors: Messrs. John Kean, W. W. Thomas, John Kean, Jr., Jacob Davis and Julian H. Kean. The litigation in which both companies contended will be discontinued."

HERE is the end that we have been predicting for the last three years, and which is none the less disgraceful in that it has been accomplished. The scheme was originally concocted to mulct the old Elizabeth Gas Company, and the final price looks to be a steep one, despite the *Gazette's* suggestion that the plant was worth $487,000.

THE proprietors of the Peoria (Ills.) Gas Light and Coke Company have just gone through an unique experience in the local court. Some time ago the controllers of the Company, with good foresight, purchased a suitable plot of land on the Illinois river for their purposes, and of a dimension well in excess of the then requirements. A modern plant was completed there less than two years ago, but so great was the growth of the "Distillery City" that this year the Company had determined to put up a 600,000 foot holder, elevators and coal sheds on a portion of the site still vacant. In the meanwhile, the Peoria Terminal Company, a concern that is in the business of operating a belt road for the transport of freight, wanted to complete its system of river tracks and made application to the authorities to condemn to its use a strip running all of the length (417 feet) of the Gas Company's water front, the depth of the strip to be 50 feet. This the Gas Company stoutly resisted, pleading that it would be unable to secure the land needed for its extensions—the necessity for which was pressing at the moment—without going to a point 1½ miles distant; further, that as all this would involve an expenditure in excess of what it would have to pay out on actual construction account on the new equipments, over and above what it would have to pay for such work, were it allowed to retain its present site, the Railroad Company should be obliged, in case the land were awarded it, to pay that sum in addition to the actual value of the land. The Gas Company put in evidence the testimony of several expert witnesses—men whose engineering talent and probity are recognized and accepted by the gas makers at large of the country—to the effect that what it claimed was only just and real, but the Court held that as this was presumptive evidence it was not admissible; that the Court only had to do with fixing the real value of the strip to be taken. The Company showed that its "presumptive damage" would not be less than $65,000, and that the real value of the strip was not below $7,000, but the Court adjudged that the damage was not in excess of $7,300, and filed that sum as the one to be allowed. The Gas Company, of course, will appeal.

THE electric lighting plant of the Lansing (Mich.) Gas Light Company will be sold to the city authorities for $45,000, the city hereafter to operate the same on municipal account.

THE estimates of the Bureau of Gas for 1893 were recently considered by the Gas Committee of Philadelphia Councils. Among other things, it was determined to reduce the proposed appropriation for coal ($1,000,000) to $900,000, and to increase the proposed appropriation for the purchase by the city of water gas from $500,000 to $600,000. A proposition to change a portion of the city plant to permit of the manufacture by the city of a certain proportion of water gas was voted down. It is said, however, that Mr. Adams will introduce a measure of the lat ter nature, in the shape of a special ordinance, before the City Councils.

Domestic Gas Light and Heater.

The Hamsley Metal Roofing Company, of this city, has on exhibition at the American Institute Fair samples of a device known as the "Domestic Gas Light and Heater," which, as it seems to us, is a very incomplete designation for it. The affair is light, strong and handsome. Directly above the flame is an adjustable dome, arranged for either high or low pressure gas. Underneath the dome the arrangement is such that if by any means gas should pass through the burners unconsumed it is caught there and ignited by the flame underneath. The upper portion or radiator is made of ornamented Russia iron, 7 inches in diameter, the whole length from top to gas ring where joined to the standard being 10 inches, and the heater complete, from top to bottom, 20 inches. Underneath the radiator are three sections of mica so arranged that new pieces can be inserted if desired. The supply of gas is furnished from two kinds of burners, one consisting of an ordinary tip, together with separate brass tube without tip to reinforce the other when necessary. The brass tube has a portion of the metal cut away just above the stopcock, permitting an increased supply of oxygen to mingle with the gas, in addition to the usual source of supply, thus affording much better combustion and a greater degree of heat, the result from this tube being a powerful blue flame.

The other method consists of two regular burners with tips. One or both may be used, as required. Each stove is supplied with a cylindrical inclosure of ornamented Russia iron the height of the heater, which tapers toward the bottom, and having three openings through which the legs project slightly. This compels the supply of cold air to be taken from the floor, and also acts as an additional radiator. Deflectors of the same material are furnished to throw the heat downward. In forming the top of the dome portions are raised, so that various cooking utensils, the bottoms of which are formed in the same die, will fit properly and not slip off. Tea kettles, stew pans, etc., are made to be used in connection with this heater, so that a variety of simple dishes can be readily prepared. The upper portion of the heater, instead of being attached to a standard, can be fastened instantly to the gas ring of a side bracket, or chandelier, and in halls, churches or other public buildings will both heat and light the structure at the same time. The standards are made in Russia iron, brass and nickel plate on brass, and rubber tubes with suitable ends are sent with all heaters.

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

MONDAY, NOVEMBER 28, 1892.

The Market for Gas Securities.

The market for city gas shares showed considerable animation this week, Consolidated being the feature. To-day (Friday) it opened at 124¼ bid, holders demanding 125, so our prediction of a year ago that the shares would sell at 125 before Christmas, 1892, is fulfilled. Another feature of the week was the demand for Standard common, which is bid for well in the 30's, but it looks to us that for the purposes of the persons who are "gunning" for the shares, the stock ought to be worth twice 30. Rumor has it that the capitalist-engineers who propose to put a tunnel through the "gnarly" rock of the East River, for the purpose of affording a gas way therein from Long Island to New York, at a sum for construction that looks ridiculously inadequate, are the parties who would like to absorb the Standard common. However, they will have to pay what the stock is worth before they can secure it, as Messrs. Sage, Terry & Co. are all that the name of the first implies. The Company will resume the payment of dividends on the preferred early in January next. Equitable and Mutual are strong and steady.

The only Brooklyn shares that hold their own are Citizens, Nassau and Williamsburgh. The Chicago dividend has been increased to 1½ per cent. quarterly. It opened to-day at 96¾ bid. The Laclede Company has declared a quarterly dividend of 1¼ per cent. on the preferred, and both the common and preferred are strong. Baltimore gas is again reported as "offered at 59." This is too low for it. Louisville gas was somewhat ragged during the week. The undercurrent, however, is very strong, as the Company's position never was better.

Gas Stocks.

Quotations by Geo. W. Close, Broker and Dealer in Gas Stocks,

16 Wall St., New York City.

November 28.

☞ All communications will receive particular attention.
☞ The following quotations are based on the par value of $100 per share.

	Capital.	Par.	Bid	Asked
Consolidated	$35,430,000	100	124¾	125
Central	500,000	50	90	95
" Scrip	220,000	—	—	100
Equitable	4,000,000	100	165	170
" Bonds	1,000,000	—	106	108
Harlem, Bonds	170,000	—	—	—
Metropolitan, Bonds	658,000	—	110	115
Mutual	3,500,000	100	142	—
" Bonds	1,500,000	—	100	102
Municipal, Bonds	750,000		—	—
Northern		50	—	—
" Bonds	150,000	—	—	100
Standard Gas Co—				
Common Stock	5,000,000	100	35	—
Preferred	5,000,000	100	85	—
Yonkers		50	112	—
Richmond Co., S. I.	346,000	50	—	—
" Bonds	20,000	—	—	—
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	130	133
Citizens	1,200,000	20	113¼	113¾
" S. F. Bonds	320,000	1000	—	103
Equity Gas Light Co.	2,000,000	100	37	—
Bonds	1,000,000	—	—	85
Fulton Municipal	3,000,000	100	130	133
" Bonds	300,000		102	—
Peoples	1,000,000	10	92	94
" Bonds (7's)	368,000	—	100	—
" " (6's)	94,000	—	100	—
Metropolitan	870,000	100	114	117
" Bonds (5's)	70,000	—	100	—
Nassau	1,000,000	25	150	—
" Ctfs	700,000	1000	99	100
Williamsburgh	1,000,000	50	133	137
" Bonds	1,000,000	—	107	110
Out of Town Gas Companies.				
Boston United Gas Co.—				
1st Series S.F. Trust	7,000,000	1000	88½	88¾
2d " " "	3,000,000	1000	77½	78
Bay State Gas Co.—				
Stock	5,000,000	50	60¾	61¾
Income Bonds	2,000,000	1000	77	78
Buffalo Mutual, N. Y.	750,000	100	110	—
" Bonds	200,000	1000	95	100
Citizens, Newark	1,000,000	50	155	160
Chicago Gas Company.	25,000,000	100	96¾	—

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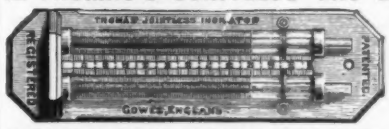

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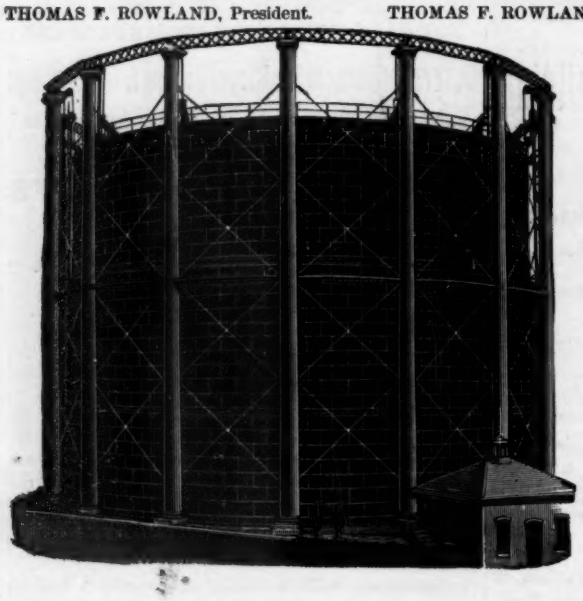

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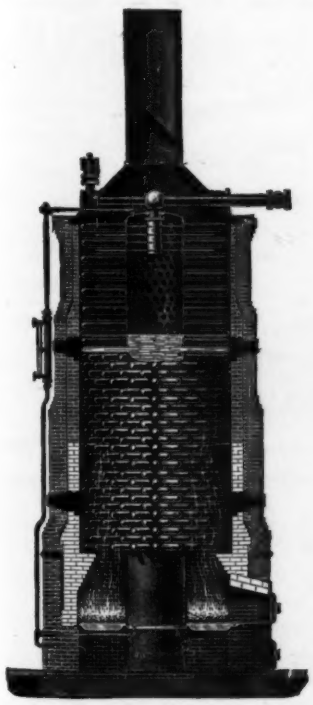

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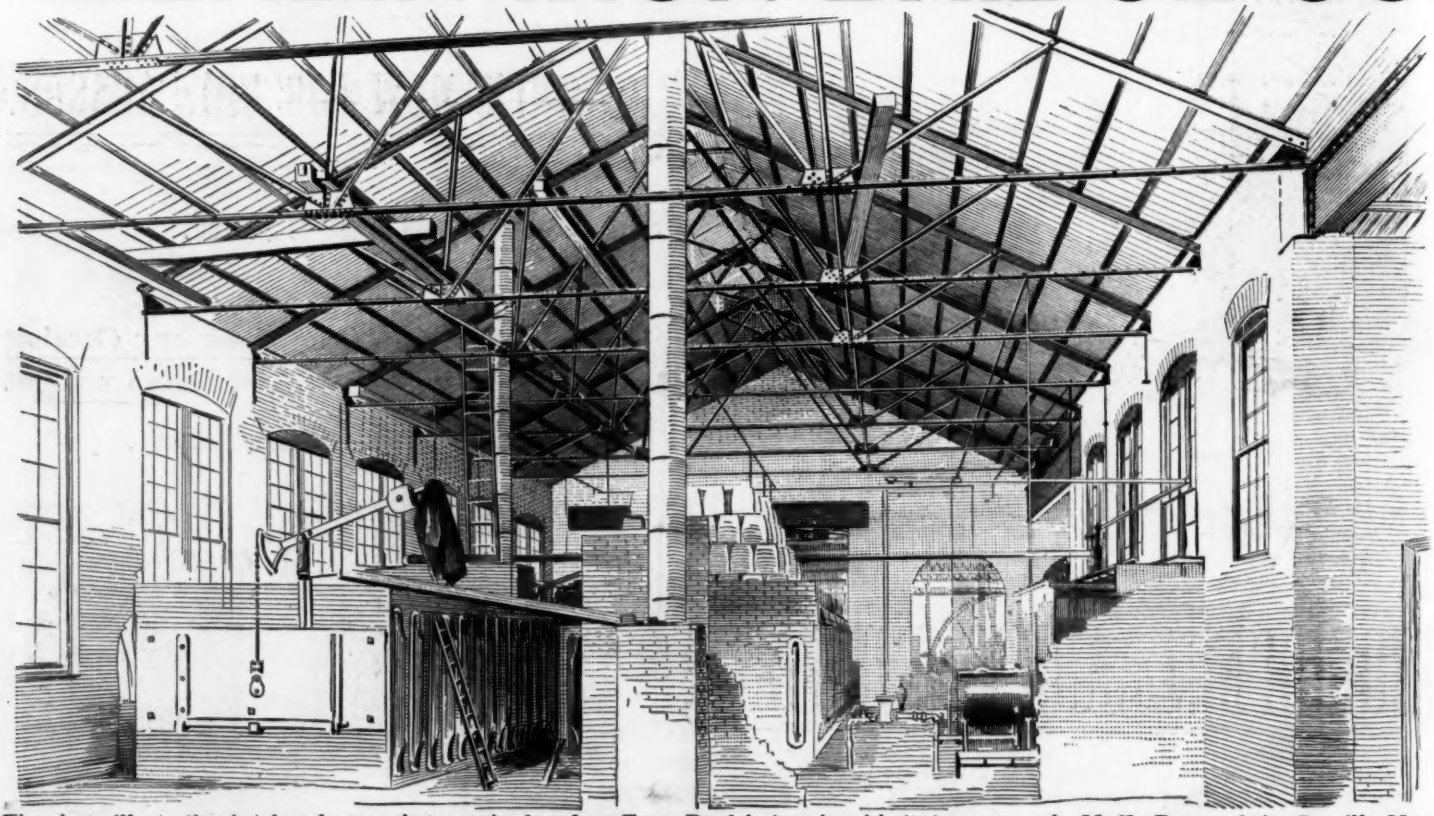

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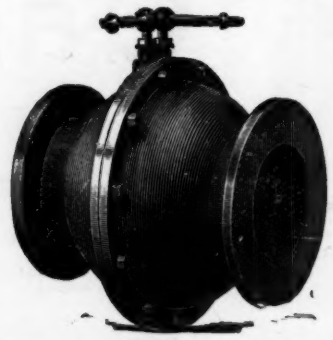

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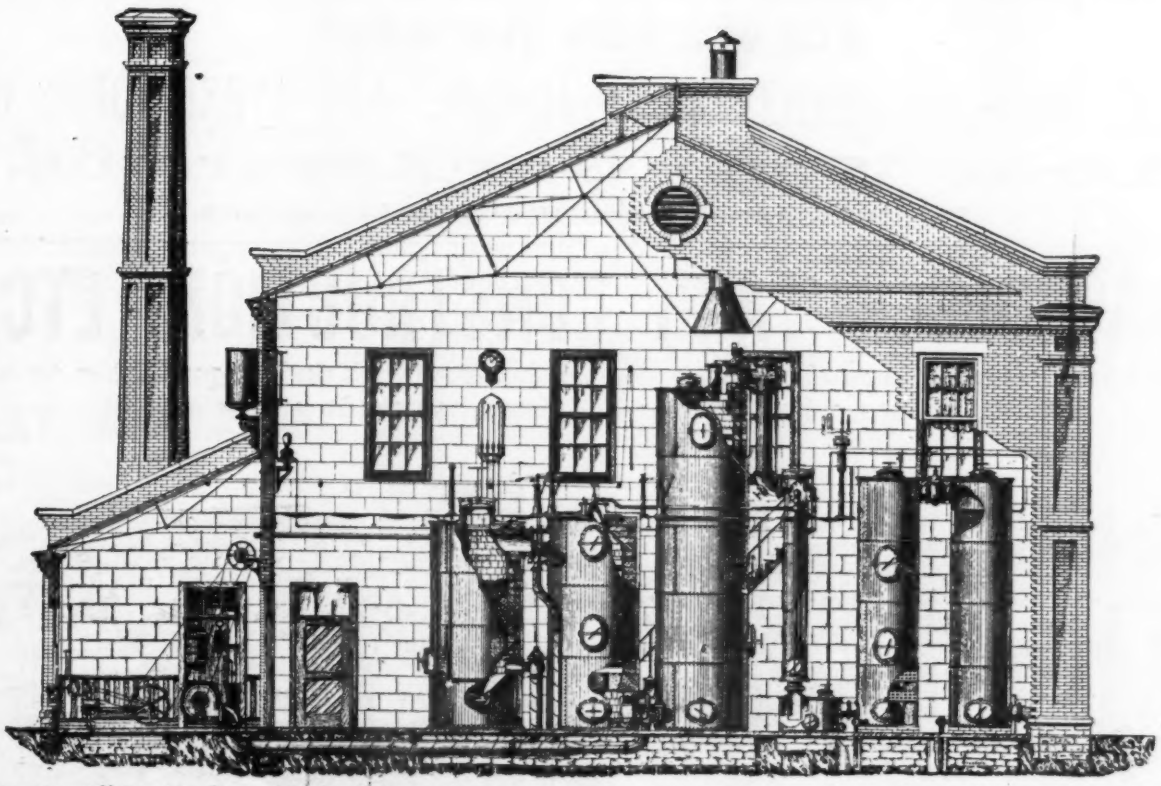

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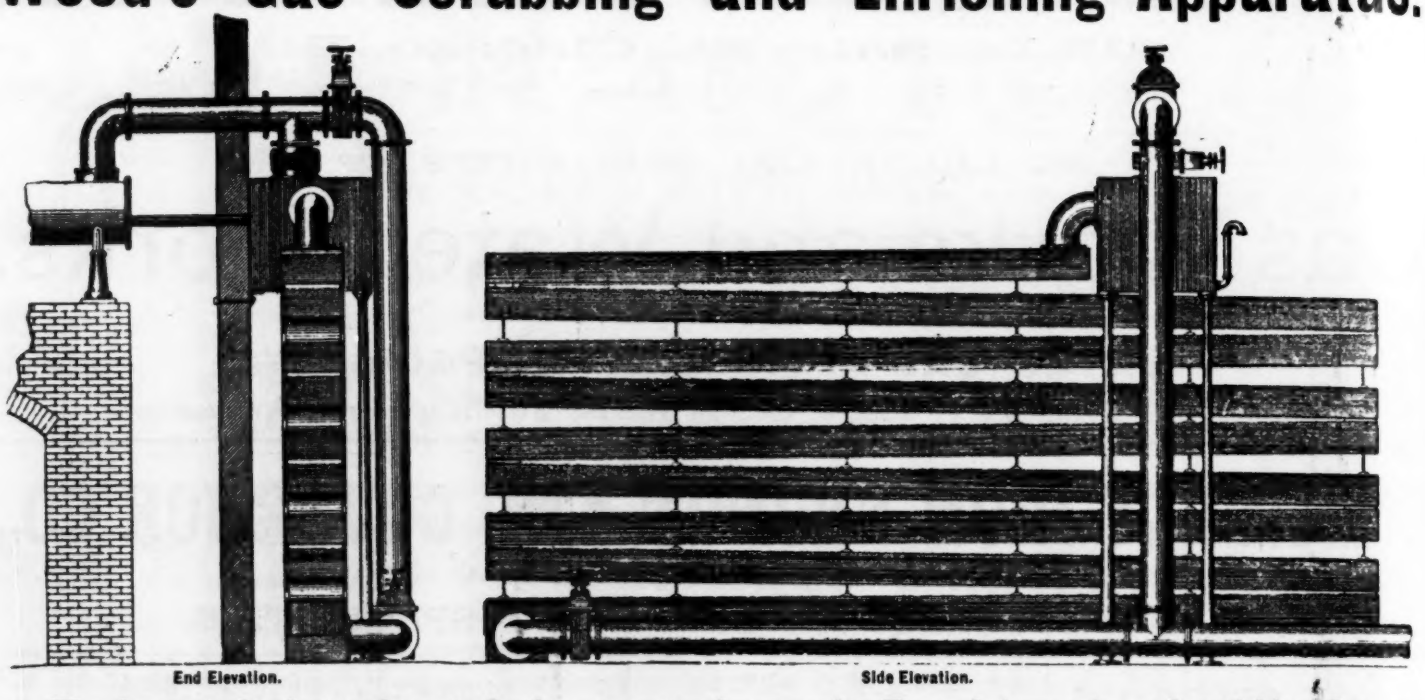

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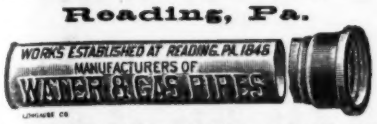

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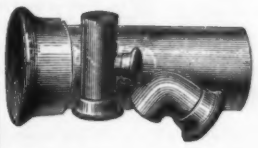

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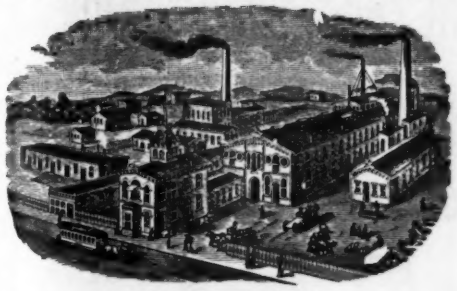

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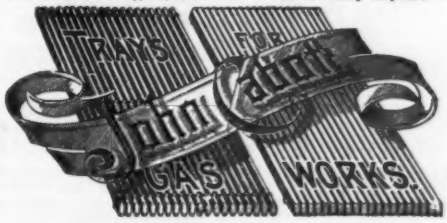

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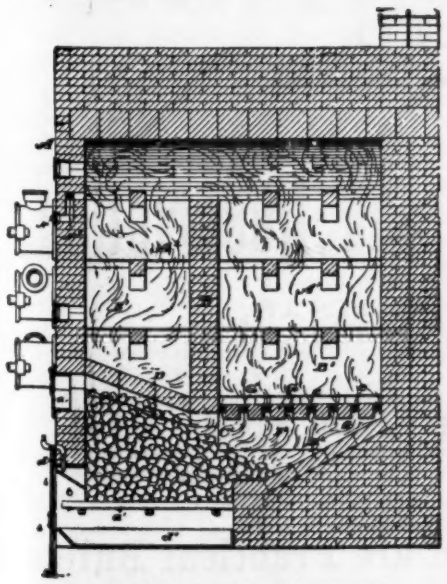

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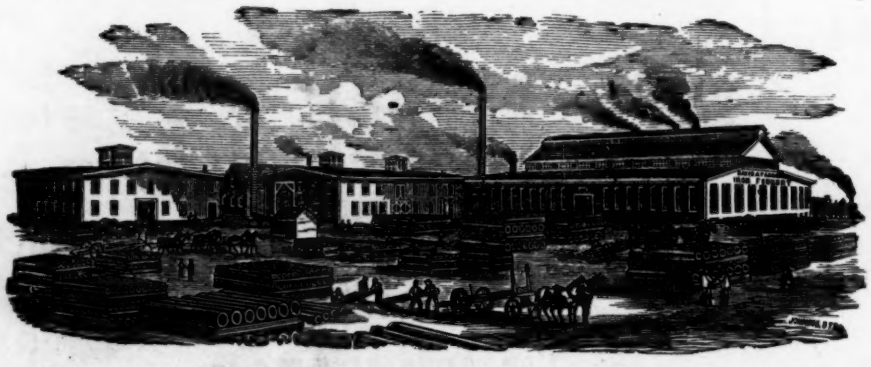

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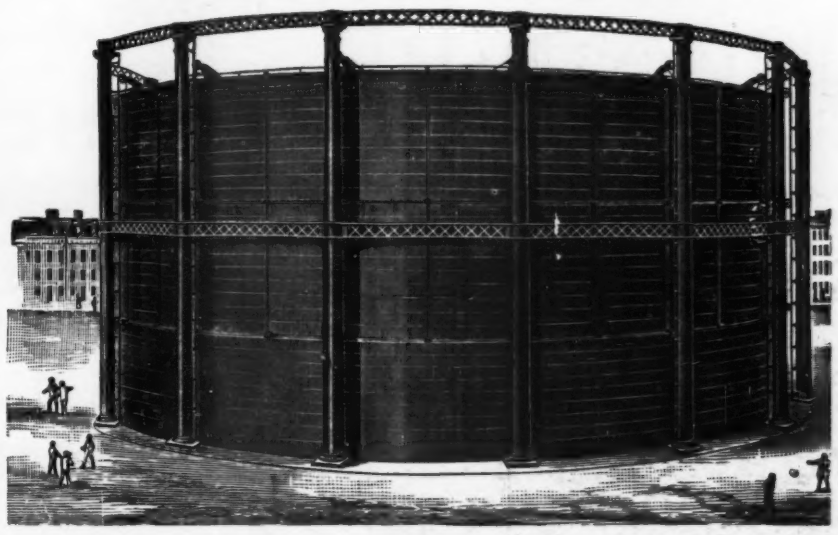

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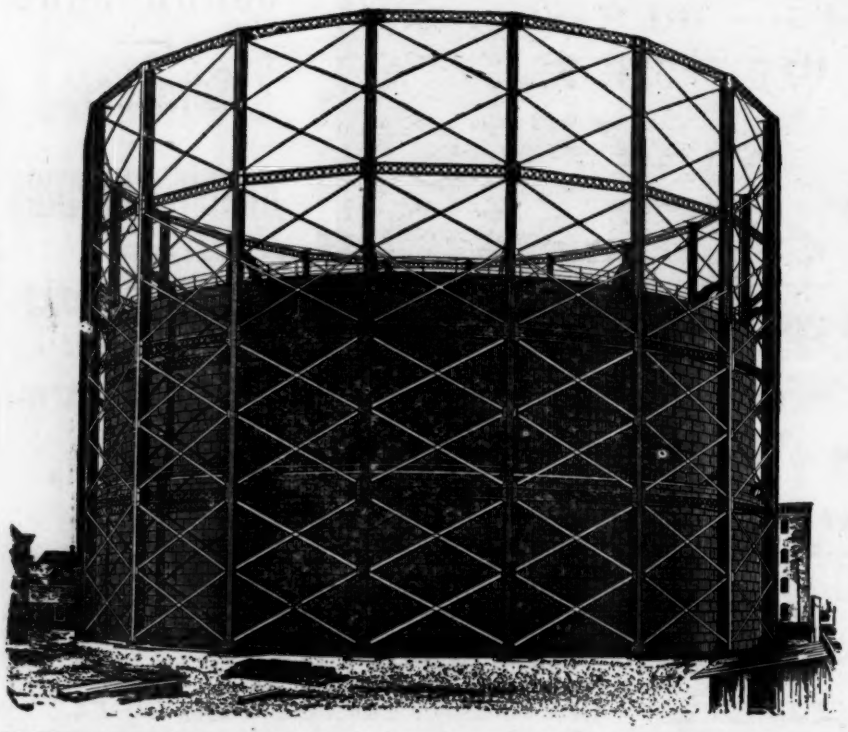

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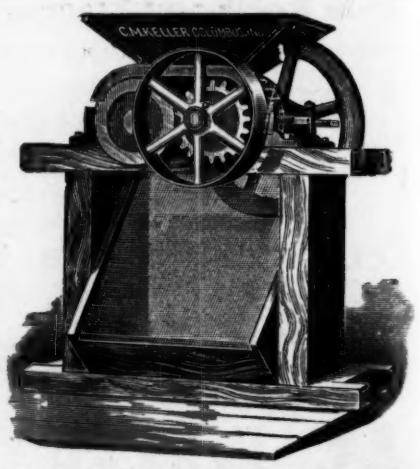

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The superior feature of this meter is that it avoids the danger of displacement of the valves, and consequent loss of gas, either in shipping, handling, or by dishonest consumers.

To designate from the regular Glover Meter, also made by us, we style the above the HEARNE-GLOVER Meter.

It is worth your consideration.

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To what extent does **Your Company** participate in this amount?

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1st. Because rates on Electric current are on the increase.

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3d. Because prices for Gas are lower than ever before.

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WILL IT PAY?

Mr. Thomas Fletcher, well known in the Gas Industry, gives his opinion on this question as follows:

"It is essential for economical working, and consequent low prices, that the plant as a whole shall be utilized as far as possible for the whole 24 hours every day, summer and winter alike. If this ideal state of things could be attained, about three or four times the output could be sold with practically no addition to the capital expenditure, *and consequently the profits would be increased to four or five times the present amount*, or even more, as the staff expenses would not rise in proportion, an account of £25 being quite as easy to deal with as one of £5, and requiring no additional office work. Instead of being the best customers, *shopkeepers* and *owners of large works* are really *the worst* the gas industry has to deal with, spite of the large total amount, and the reason is simple. The consumption is enormous during two or three hours in winter, entailing the necessity of enormous holders and very large distributing plant, all of which is absolutely idle during the summer. THE BEST OF ALL CUSTOMERS ARE THOSE WHO USE GAS FOR ENGINES, workshop and industrial purposes, as these will use a steady supply for about ten hours daily, winter and summer alike, and *these are the users worthy of the greatest consideration.* Next to these come the users of gas cooking appliances and gas fires, they also being practically steady users for long hours both in the winter and summer. Domestic lighting does not come out anything so favorably, as the consumption in the winter averages over double that in the summer, entailing the loss on idle plant during a large portion of the year. The dream of the gas engineer is a large summer and 'day gas' consumption, and on *these depend large profits and economical working.*"

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